2006 HVAC

HVAC Systems - Automatic - Lucerne

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
A/C Evaporator Case Upper Screw	1.0 N.m	9 lb in
Air Temperature Actuator Screw	1.0 N.m	9 lb in
Heating and Air Conditioning Control Assembly Screw	1.0 N.m	9 lb in
Inside Air Temperature Sensor Screw	1.0 N.m	9 lb in
Mode Actuator Screw	1.0 N.m	9 lb in
Recirculation Actuator Screw	1.0 N.m	9 lb in

SCHEMATIC AND ROUTING DIAGRAMS

HVAC SCHEMATICS

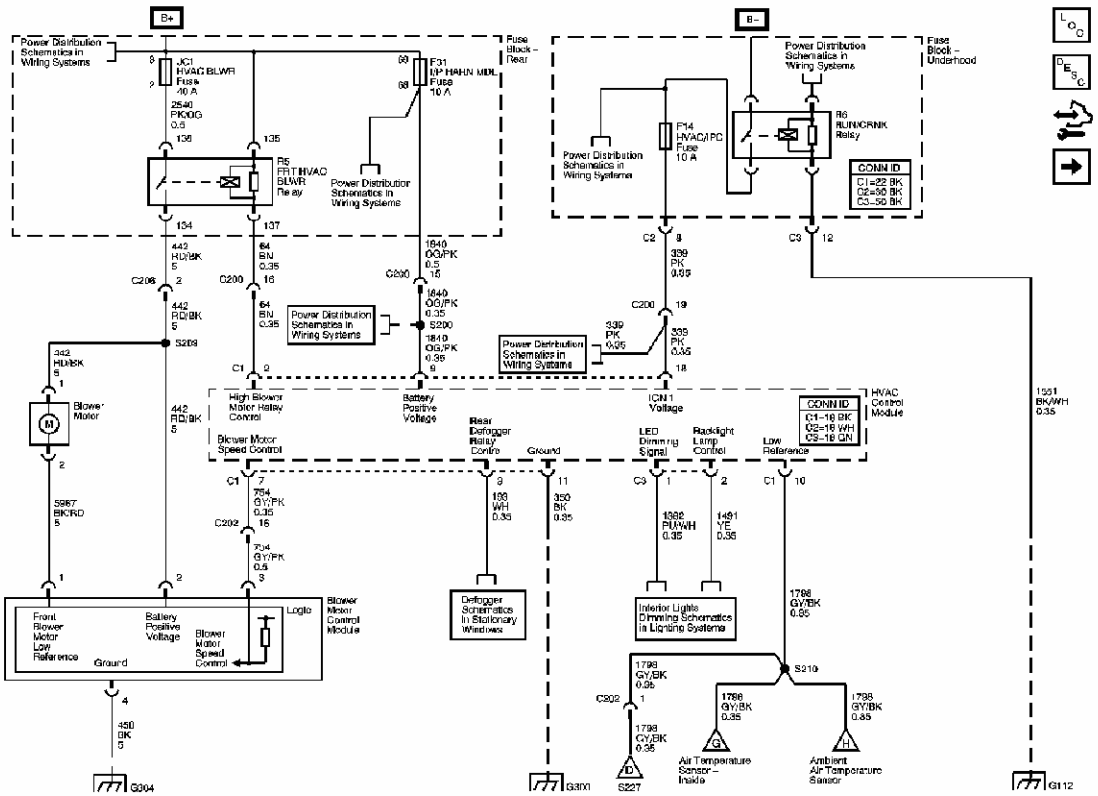


Fig. 1: Power, Ground & Blower Motor Controls Schematic
Courtesy of GENERAL MOTORS CORP.

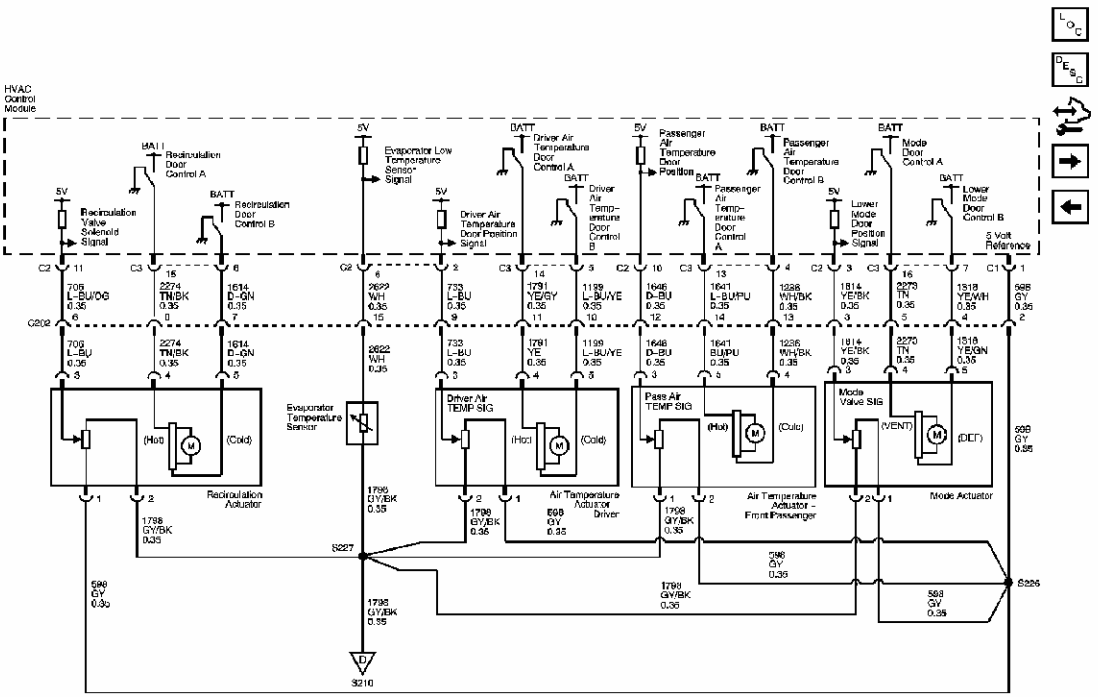


Fig. 2: Mode & Air Temperature Controls Schematic

Courtesy of GENERAL MOTORS CORP.

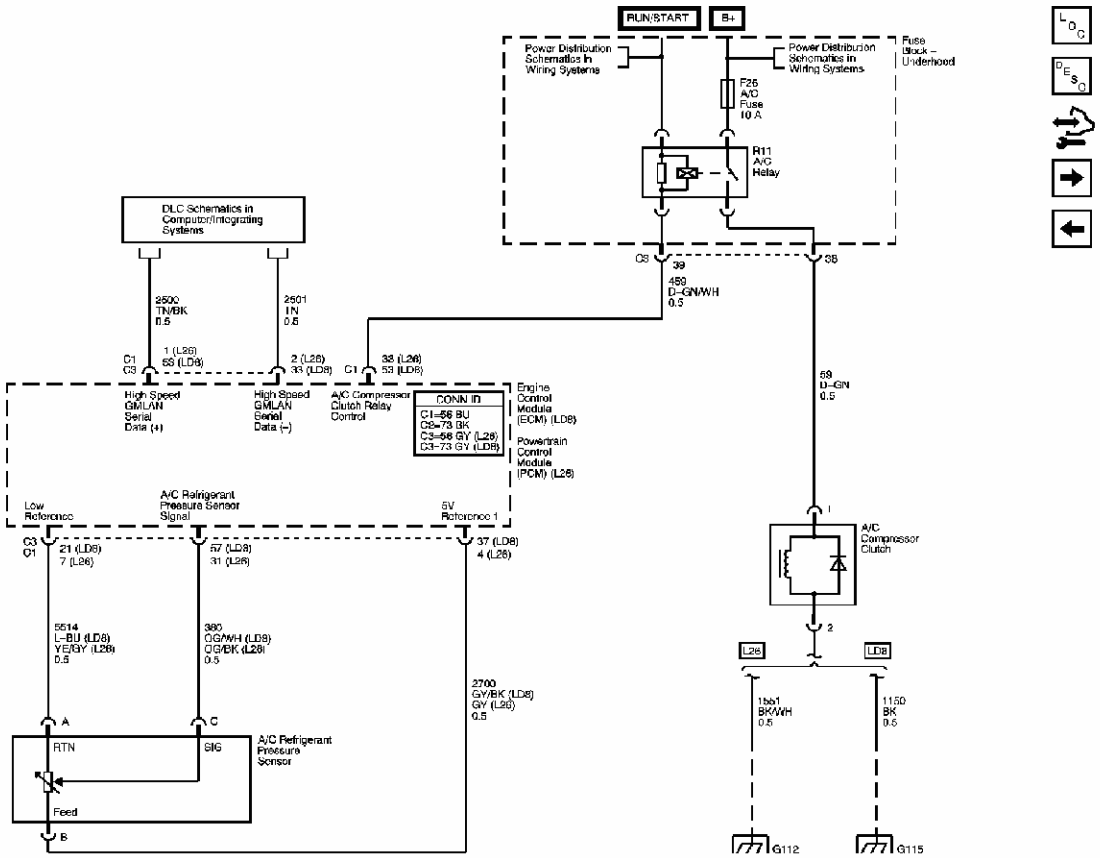


Fig. 3: Compressor Controls Schematic
Courtesy of GENERAL MOTORS CORP.

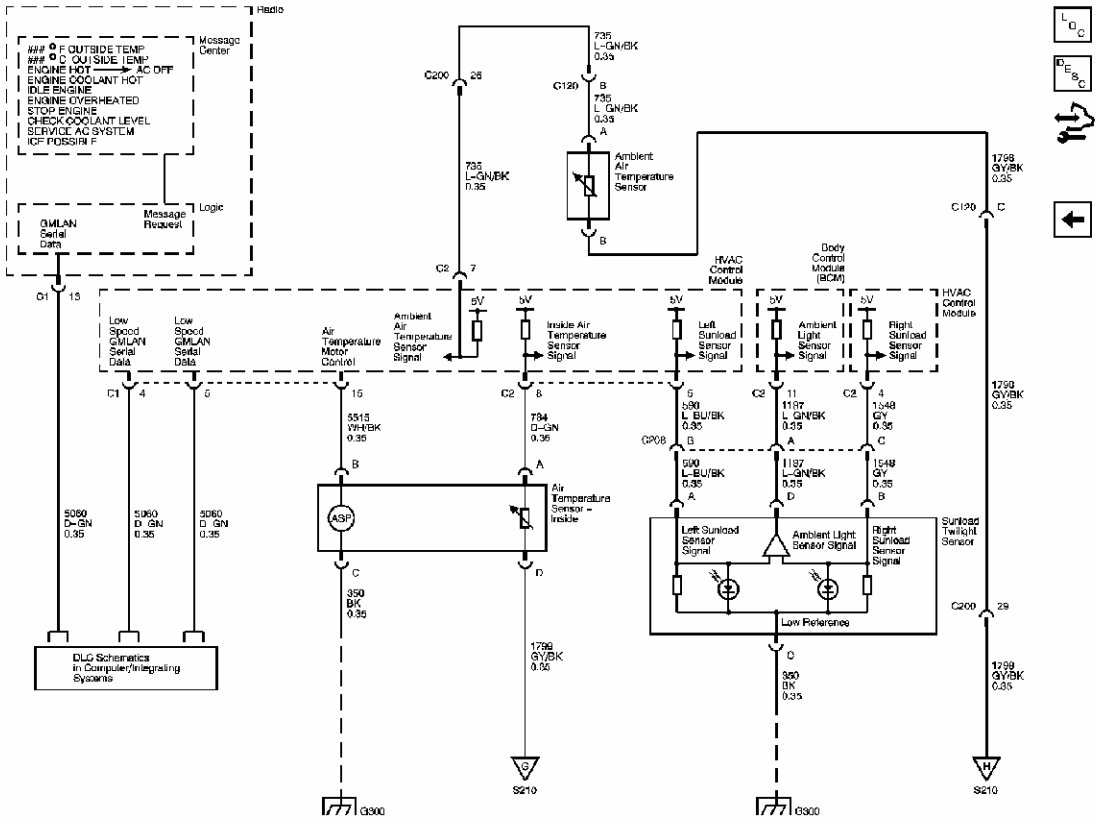


Fig. 4: Air Temperature Sensors Schematic
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

HVAC COMPONENT VIEWS

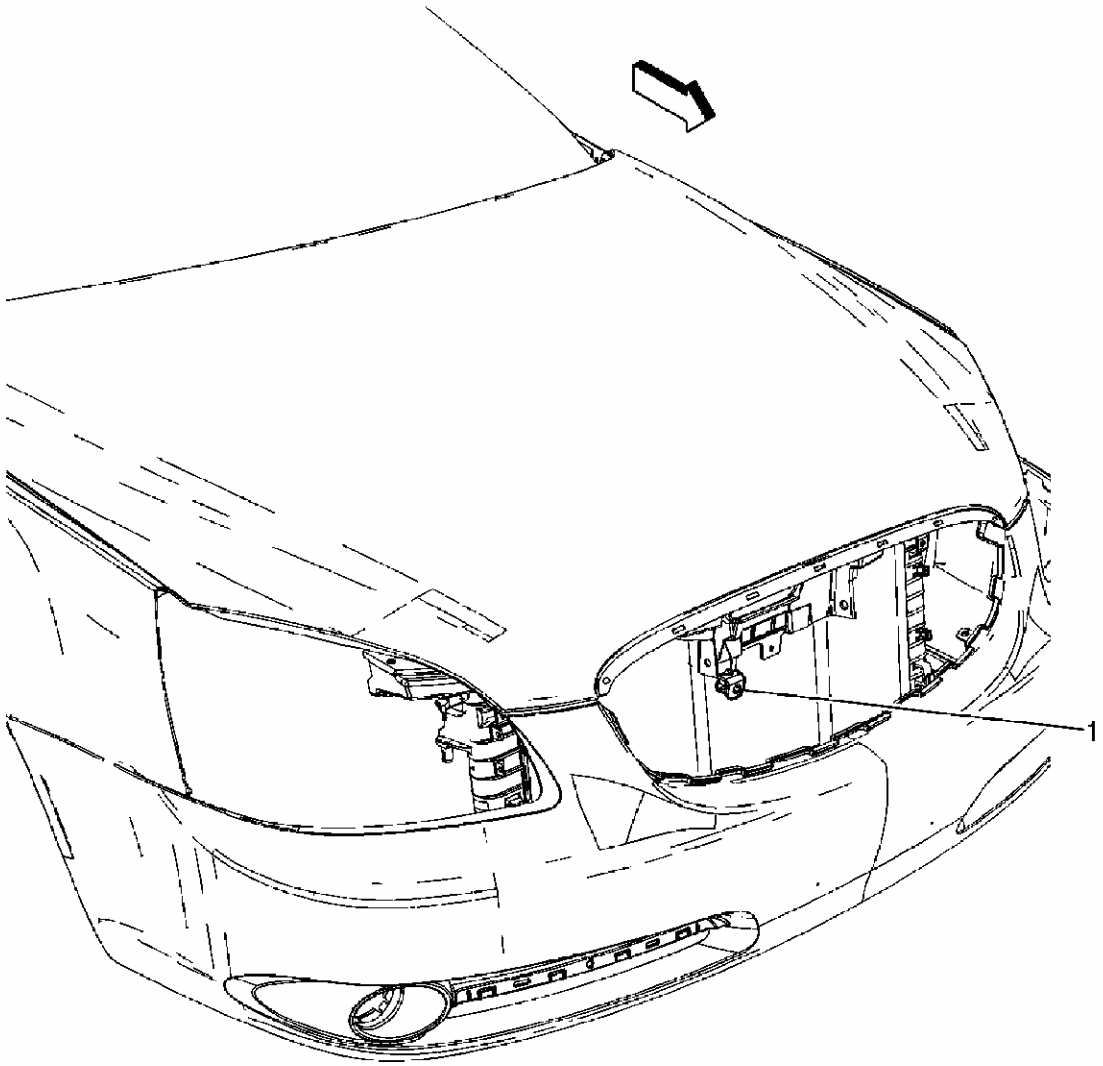


Fig. 5: Identifying Behind The Front Grille Components
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 5

Callout	Component Name
1	Ambient Air Temperature Sensor

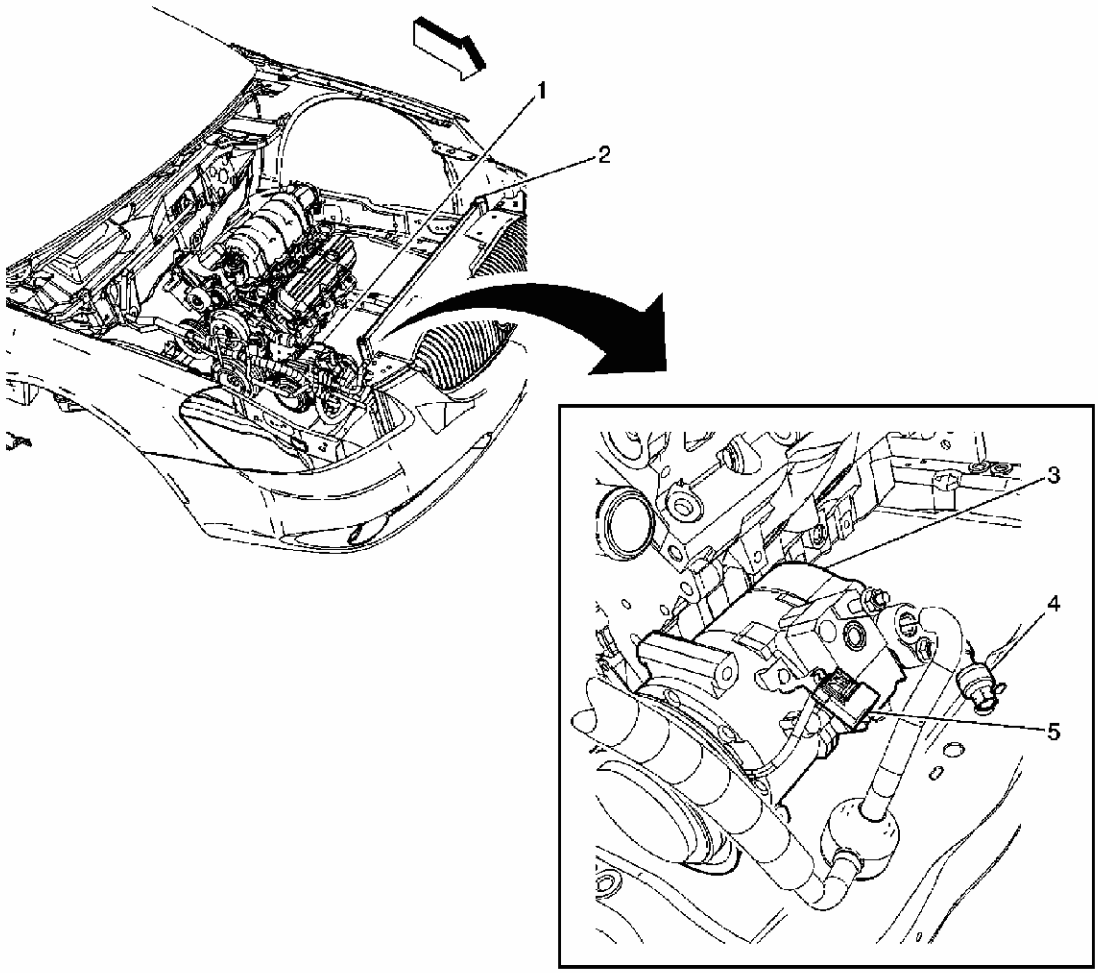


Fig. 6: Identifying Front Engine Compartment Components
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 6

Callout	Component Name
1	A/C Compressor
2	A/C Condensor
3	A/C Compressor
4	A/C Refrigerant Pressure Sensor
5	A/C Compressor Clutch Connector

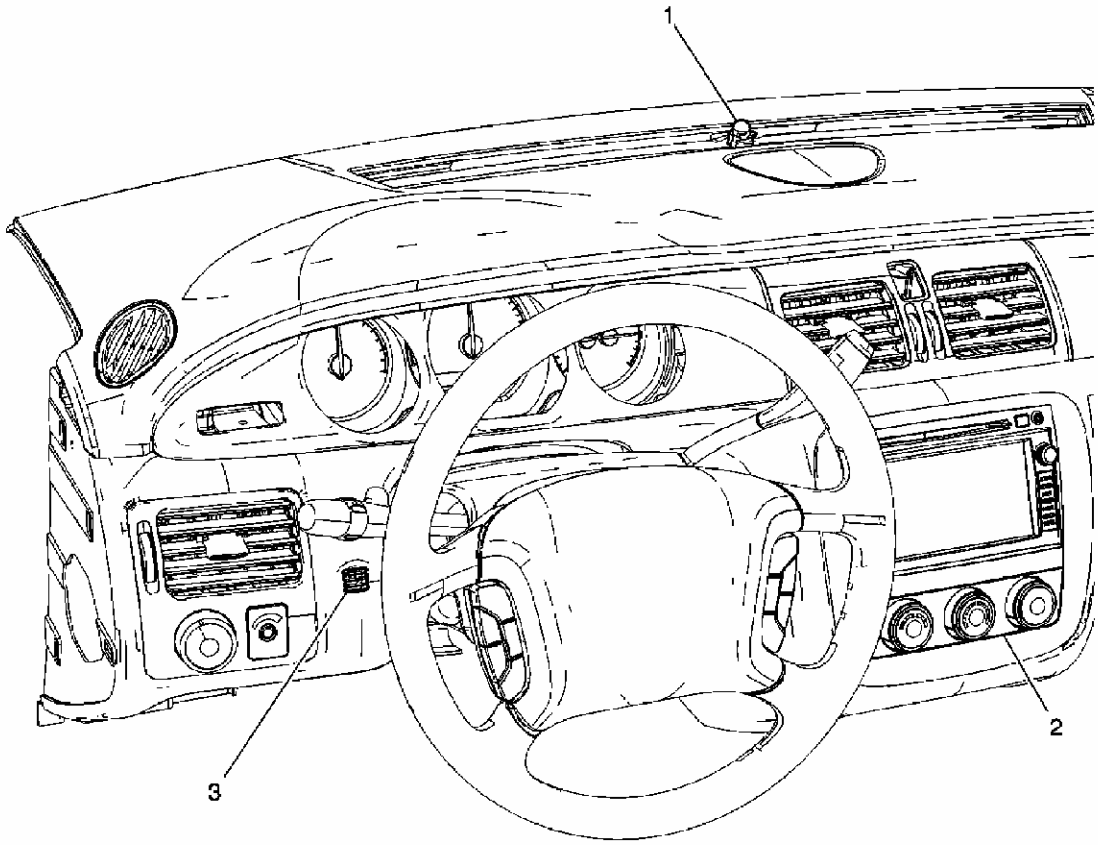


Fig. 7: Identifying Instrument Panel Components
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 7

Callout	Component Name
1	Sunload Twilight Sensor
2	HVAC Control Module
3	Air Temperature Sensor-Inside

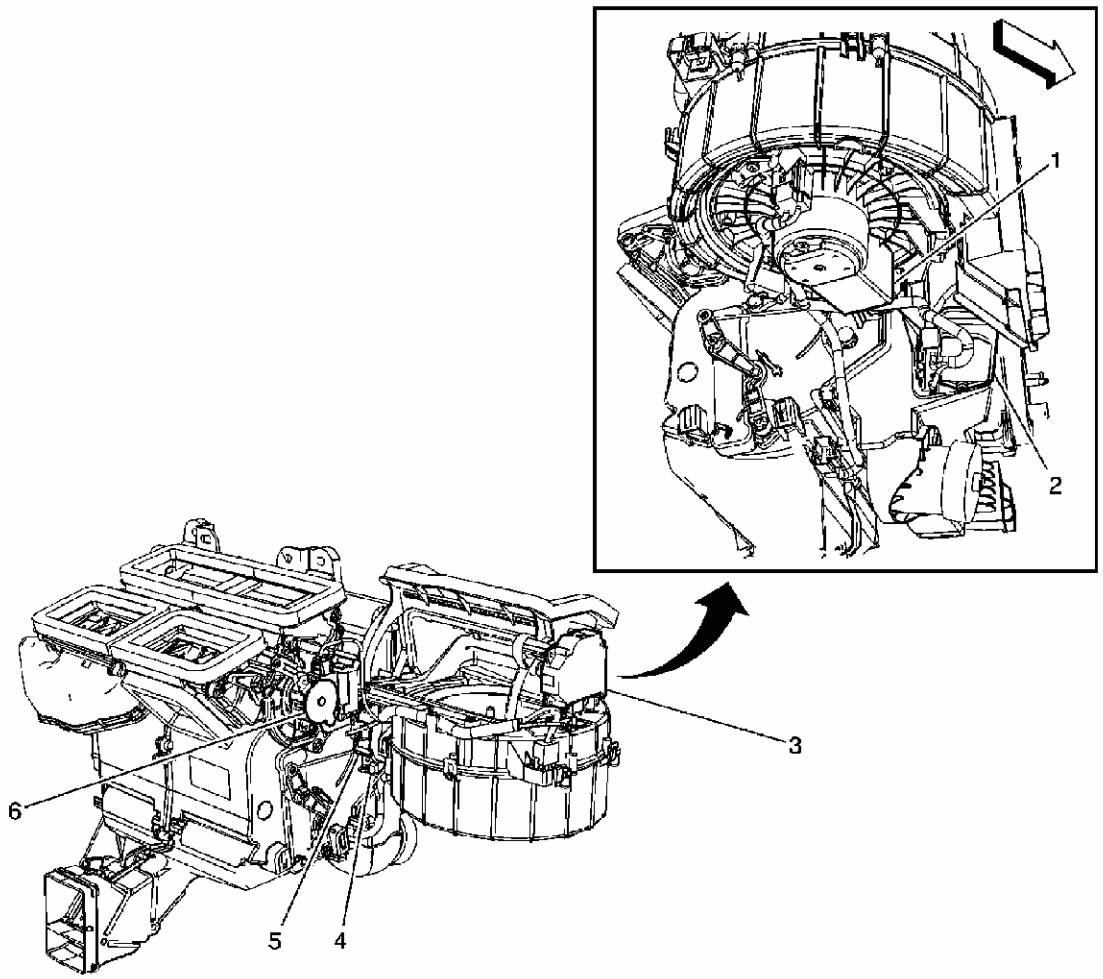


Fig. 8: Identifying HVAC Module Components (C67)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 8

Callout	Component Name
1	Blower Motor
2	Blower Motor Control Module
3	Recirculation Actuator
4	EVAP Temperature Sensor
5	Air Temperature Actuator
6	Mode Actuator

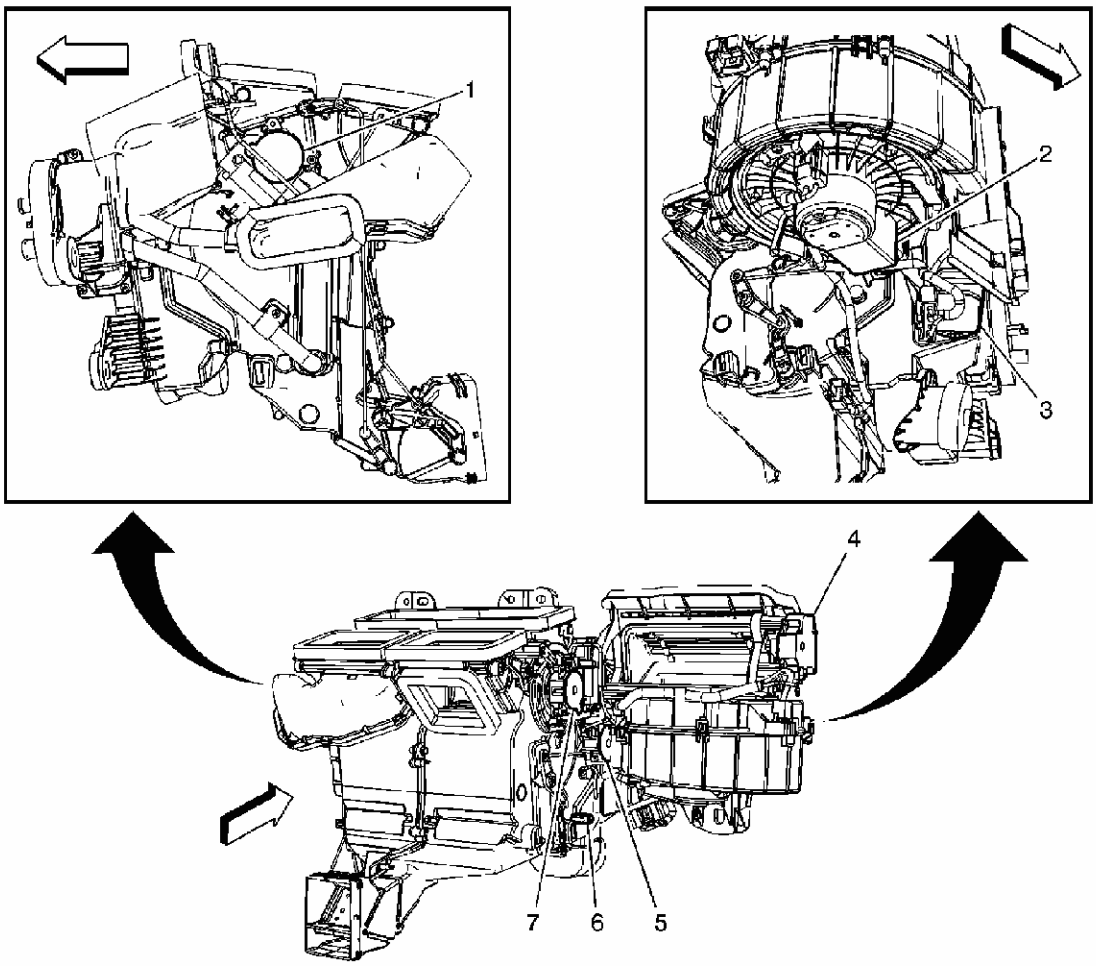


Fig. 9: Identifying HVAC Module Components (CJ2)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 9

Callout	Component Name
1	Air Temperature Actuator - Driver (CJ4/CJ2)
2	Blower Motor
3	Blower Motor Control Module
4	Recirculation Actuator
5	Air Temperature Actuator - Front Passenger (CJ4/CJ2)
6	EVAP Temperature Sensor
7	Mode Actuator

HVAC CONNECTOR END VIEWS

A/C Compressor Clutch

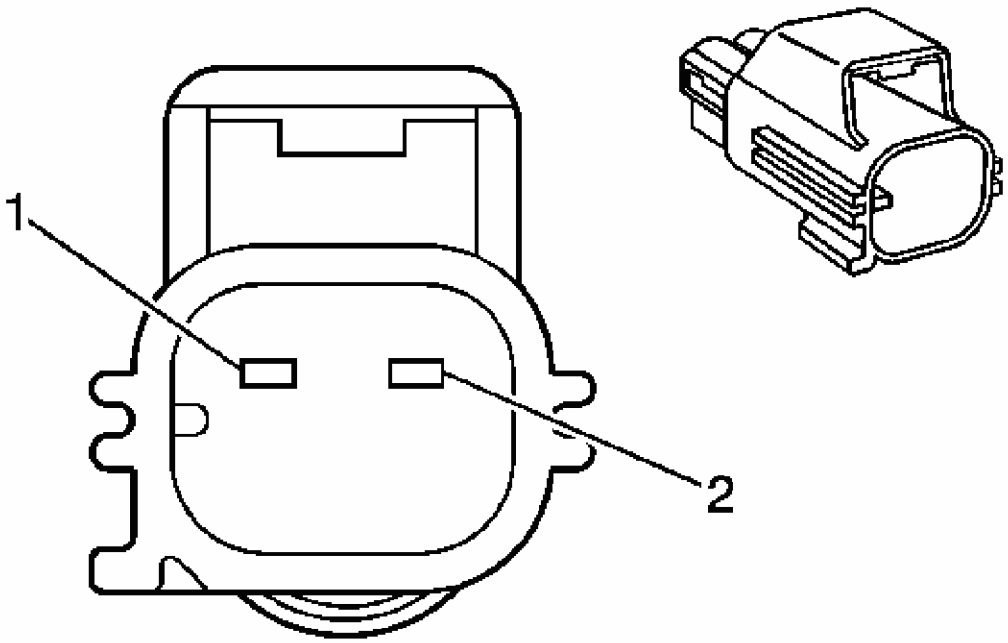


Fig. 10: A/C Compressor Clutch Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 7282-5548-30
- Service: 88953303
- Description: 2-Way M YESC Weather Pack (BK)

Terminal Part Information

- Terminal/Tray: 7114-4102-08/9
- Core/Insulation Crimp: E/1
- Release Tool/Test Probe: 12094430/J-35616-3 (GY)

A/C Compressor Clutch

Pin	Wire Color	Circuit No.	Function
1	D-GN	59	A/C Compressor Clutch Supply Voltage
2	BK/WH	1551	Ground (L26)

2	BK	1150	Ground (LD8)

A/C Refrigerant Pressure Sensor

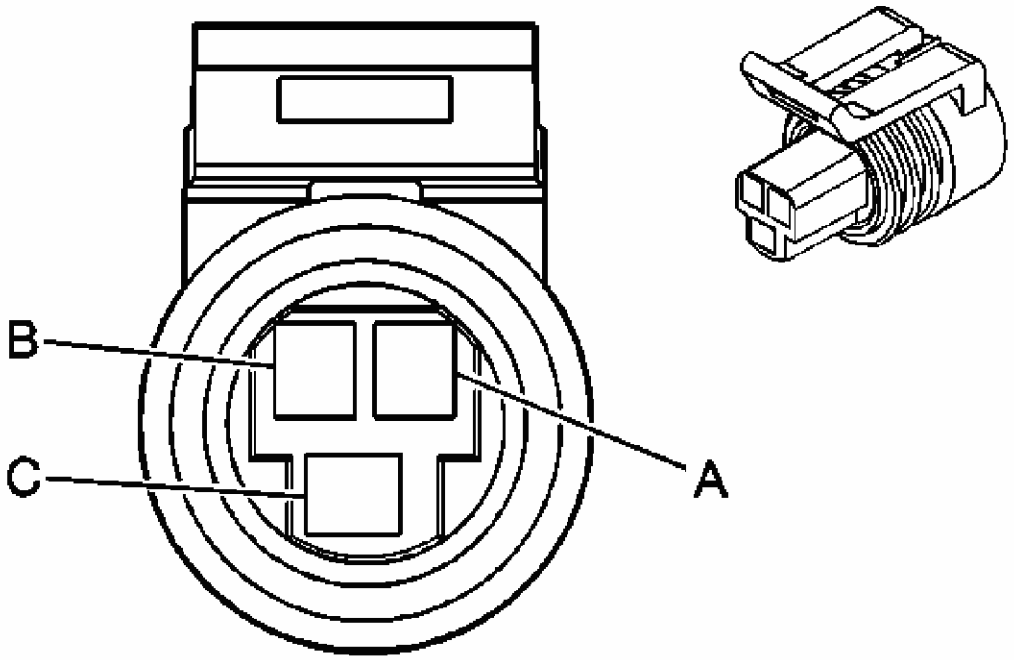


Fig. 11: A/C Refrigerant Pressure Sensor Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 12078090
- Service: 88988301
- Description: 3-Way F Metri-Pack 150 Series (NA)

Terminal Part Information

- Terminal/Tray: 12103881/2
- Core/Insulation Crimp: E/C
- Release Tool/Test Probe: 12180559-1/J-35616-2A (GY)

A/C Refrigerant Pressure Sensor

Pin	Wire Color	Circuit No.	Function
A	YE/GY	5514	Low Reference (L26)
A	L-BU	5514	Low Reference (LD8)
B	GY	2700	5-Volt Reference (L26)
B	GY/BK	2700	5-Volt Reference (LD8)
C	OG/BK	380	A/C Refrigerant Pressure Sensor Signal (L26)
C	OG/WH	380	A/C Refrigerant Pressure Sensor Signal (LD8)

Air Temperature Actuator - Driver

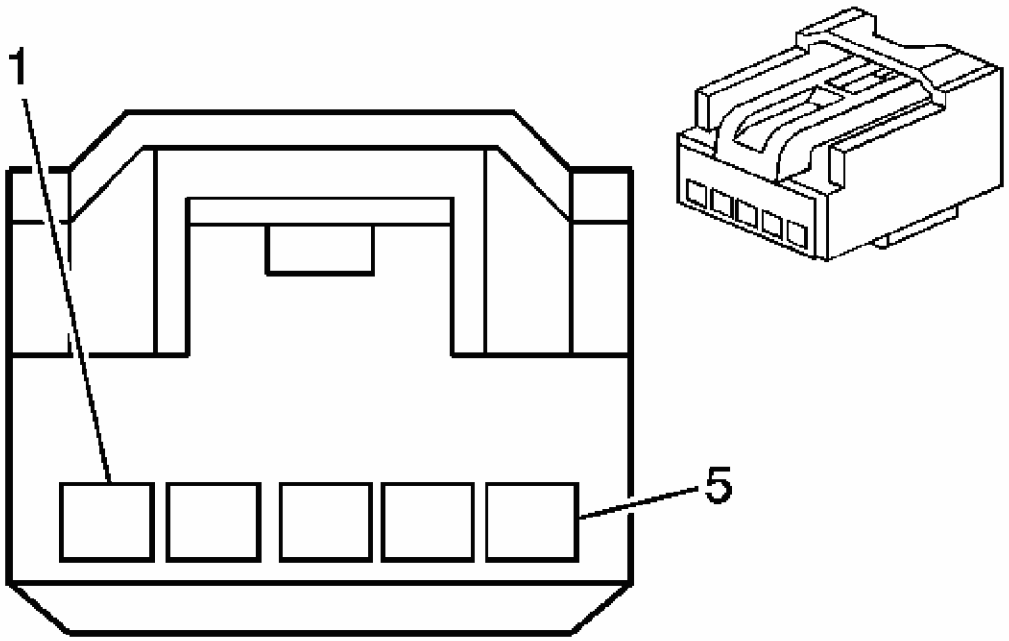


Fig. 12: Air Temperature Actuator - Driver Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 7283-5830-30
- Service: 89046839
- Description: 5-Way F (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Air Temperature Actuator - Driver

Pin	Wire Color	Circuit No.	Function
1	GY	598	5-Volt Reference
2	GY/BK	1798	Low Reference
3	L-BU	733	Driver Air Temperature Door Position Signal
4	YE	1791	Driver Air Temperature Door Control A
5	L-BU/YE	1199	Driver Air Temperature Door Control B

Air Temperature Actuator - Front Passenger

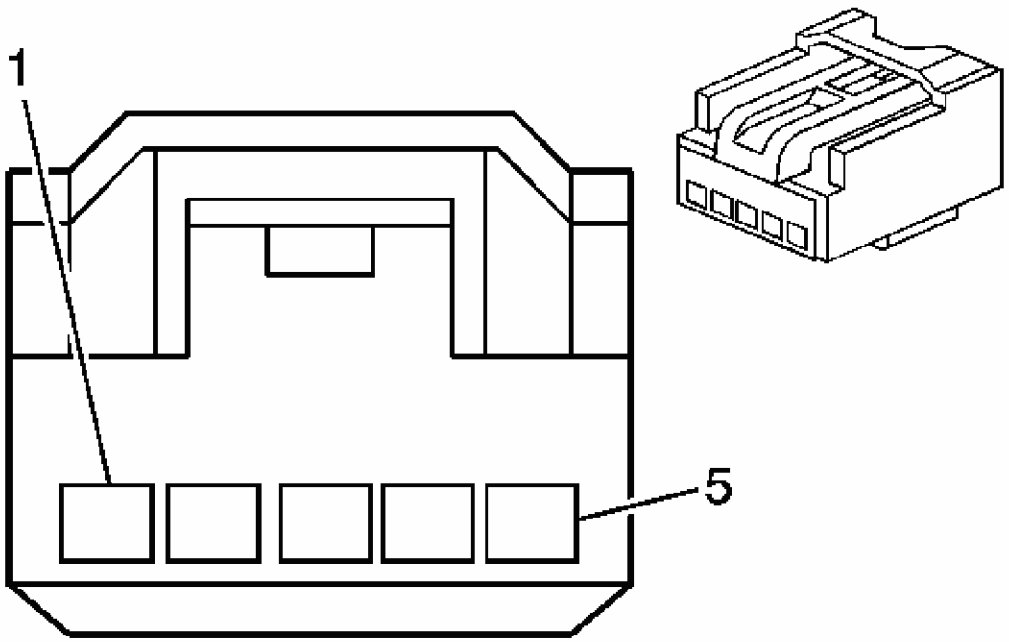


Fig. 13: Air Temperature Actuator Connector End View - Front Passenger
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 7283-5830-30
- Service: 89046839
- Description: 5-Way F (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Air Temperature Actuator - Front Passenger

Pin	Wire Color	Circuit No.	Function
1	GY/BK	1798	Low Reference
2	GY	598	5-Volt Reference
3	D-BU	1646	Passenger Air Temperature Door Position
4	WH/BK	1236	Passenger Air Temperature Door Control B
5	L-BU/PU	1641	Passenger Air Temperature Door Control A

Air Temperature Sensor - Inside

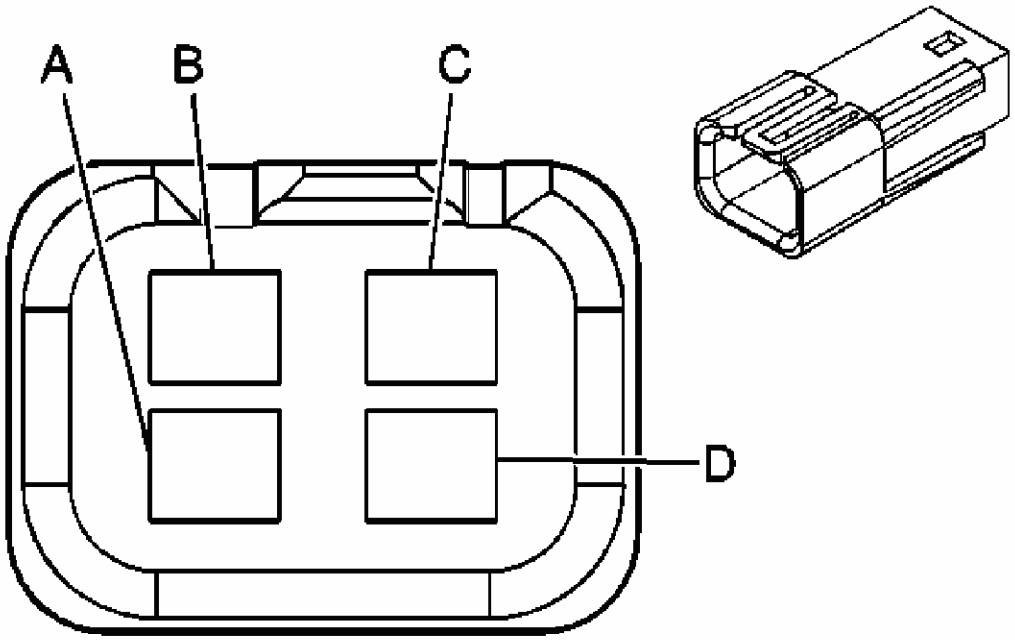


Fig. 14: Air Temperature Sensor Connector End View - Inside
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 12047786
- Service: 12085536
- Description: 4-Way M Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: 12047581/2
- Core/Insulation Crimp: E/C
- Release Tool/Test Probe: 12094429/J-35616-3 (GY)

Air Temperature Sensor - Inside

Pin	Wire Color	Circuit No.	Function
A	D-GN	734	Inside Air Temperature Sensor Signal
B	WH/BK	5515	Air Temperature Motor Control
C	BK	350	Ground

D	GY/BK	1798	Low Reference

Ambient Air Temperature Sensor

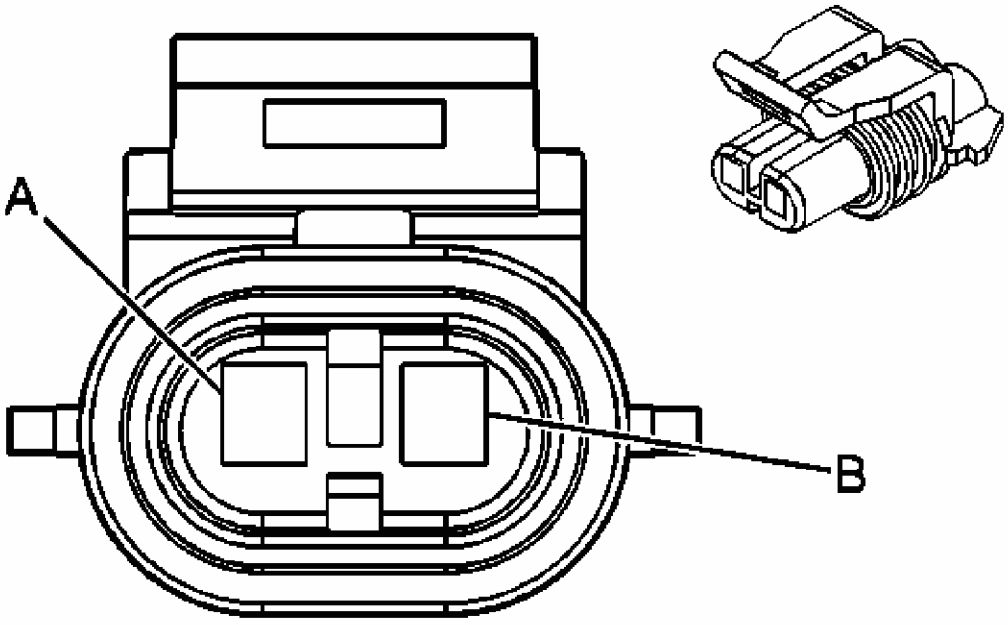


Fig. 15: Sliding Door Detent Switch - (E58/E59) Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 12052642
- Service: 12101856
- Description: 2-Way M Metri-Pack 150 Series Sealed (L-GN)

Terminal Part Information

- Terminal/Tray: 12048074/2
- Core/Insulation Crimp: E/1
- Release Tool/Test Probe: 12094429/J-35616-2A (GY)

Ambient Air Temperature Sensor

Pin	Wire Color	Circuit No.	Function

A	L-GN/BK	735	Ambient Air Temperature Sensor Signal
B	GY/BK	1798	Low Reference

Blower Motor

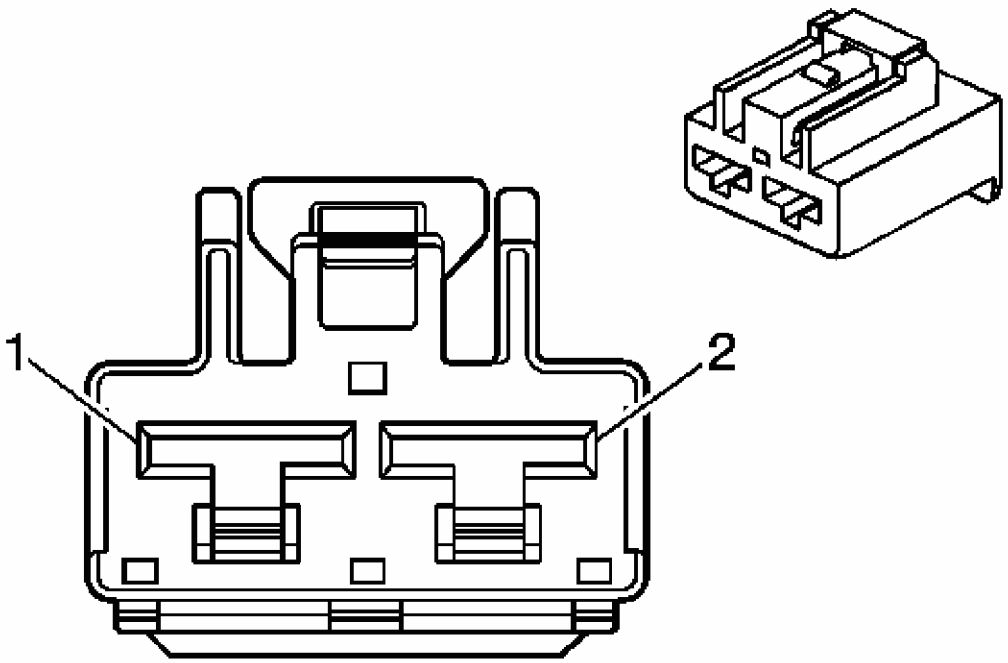


Fig. 16: Blower Motor Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 6098-1315
- Service: See Catalog
- Description: 2-Way F (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Blower Motor

Pin	Wire Color	Circuit No.	Function
1	RD/BK	442	Battery Positive Voltage
2	BK/RD	5987	Front Blower Motor Low Reference

Blower Motor Control Module

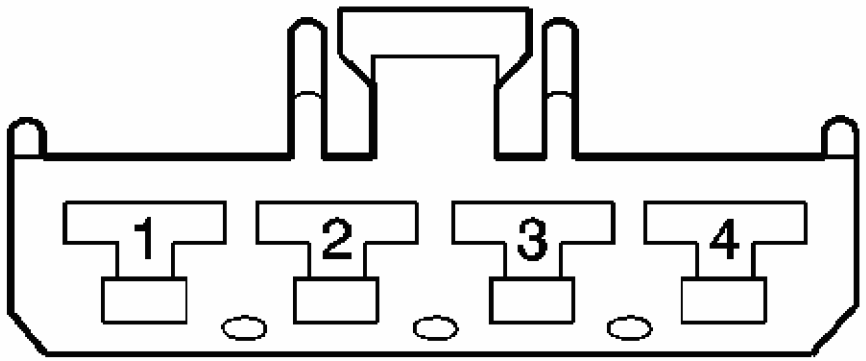


Fig. 17: Blower Motor Control Module Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 6098-1449
- Service: 88988396
- Description: 4-Way F (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Blower Motor Control Module (CJ2)

Pin	Wire Color	Circuit No.	Function
1	BK/RD	5987	Front Blower Motor Low Reference
2	RD/BK	442	Battery Positive Voltage

3	GY/PK	754	Blower Motor Speed Control
4	BK	450	Ground

HVAC Control Module C1

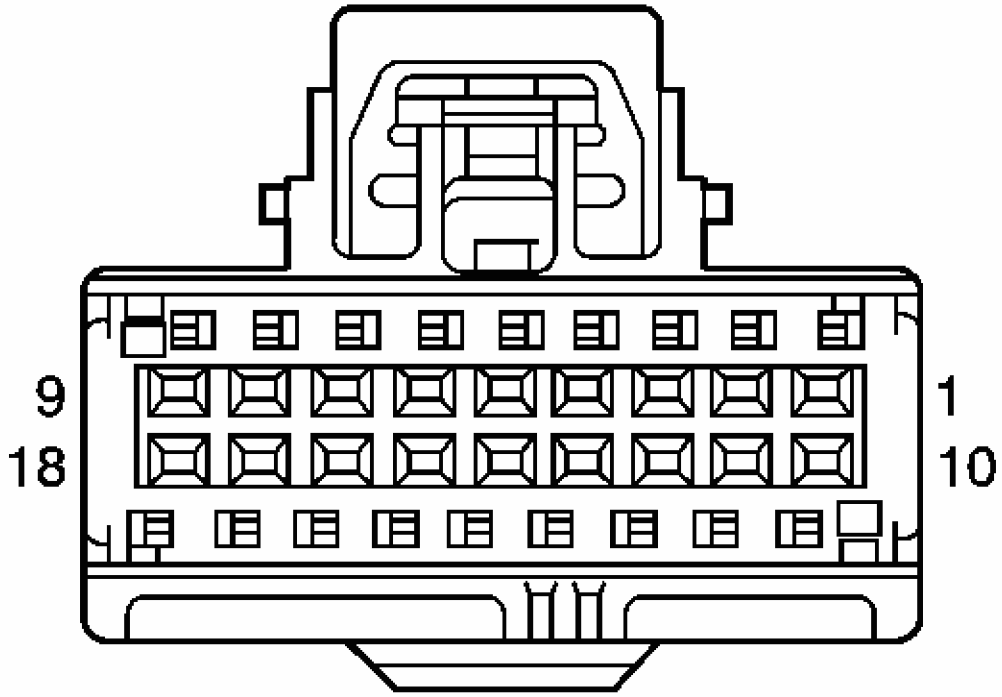


Fig. 18: HVAC Control Module C1 Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 7283-4544-30
- Service: See Catalog
- Description: 18-Way F (BK)

Terminal Part Information

- Pins: 1, 2, 3, 4, 5, 7, 9, 10, 11, 15, 18
- Terminal/Tray: 7116-4618-02/14
- Core/Insulation Crimp: P/P

- Release Tool/Test Probe: J-38125-215/J-35616-64B (L-BU)

HVAC Control Module C1

Pin	Wire Color	Circuit No.	Function
1	GY	598	5-Volt Reference
2	BN	64	High Blower Motor Relay Control
3	WH	193	Rear Defog Relay Control
4	D-GN	5060	Low Speed GMLAN Serial Data
5	D-GN	5060	Low Speed GMLAN Serial Data
6	-	-	Not Used
7	GY/PK	754	Blower Motor Speed Control
8	-	-	Not Used
9	OG/PK	1840	Battery Positive Voltage
10	GY/BK	1798	Low Reference
11	BK	350	Ground
12-14	-	-	Not Used
15	WH/BK	5515	Air Temperature Motor Control
16-17	-	-	Not Used
18	PK	339	Ignition 1 Voltage

HVAC Control Module C2

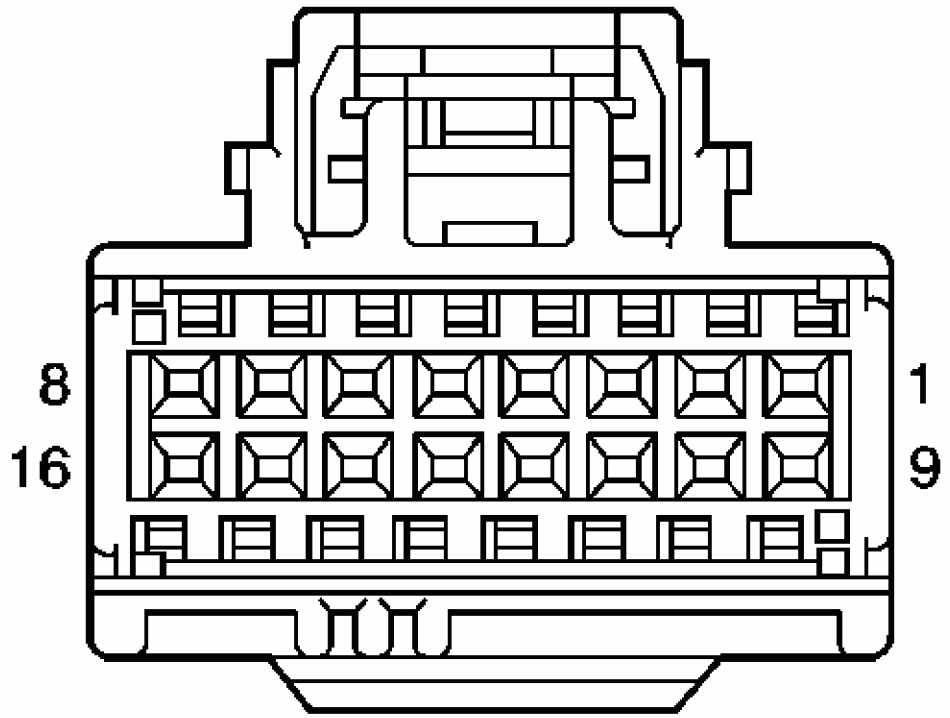


Fig. 19: HVAC Control Module C2 Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 7283-9081
- Service: See Catalog
- Description: 16-Way F (WH)

Terminal Part Information

- Pins: 2, 3, 4, 5, 6, 7, 8, 10, 11
- Terminal/Tray: 7116-4618-02/14
- Core/Insulation Crimp: P/P
- Release Tool/Test Probe: J-38125-215/J-35616-64B (L-BU)

HVAC Control Module C2

Pin	Wire Color	Circuit No.	Function

1	-	-	Not Used
2	L-BU	733	Driver Air Temperature Door Position Signal
3	YE/BK	1814	Lower Mode Door Position Signal
4	GY	1548	Right Sunload Sensor Signal
5	L-BU/BK	590	Left Sunload Sensor Signal
6	WH	2622	Evaporator Low Temperature Sensor Signal
7	L-GN/BK	735	Ambient Air Temperature Sensor Signal
8	D-GN	734	Inside Air Temperature Sensor Signal
9	-	-	Not Used
10	D-BU	1646	Passenger Air Temperature Door Position
11	L-BU/OG	706	Recirculation Valve Solenoid Signal
12-16	-	-	Not Used

HVAC Control Module C3

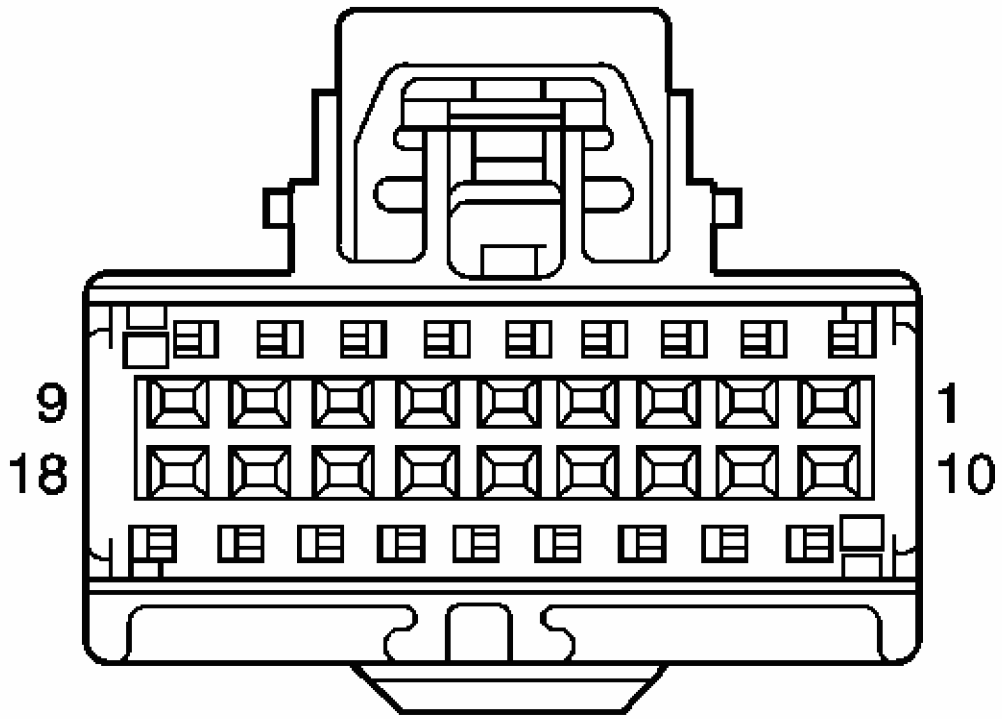


Fig. 20: HVAC Control Module C3 Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 7283-4548-60
- Service: See Catalog
- Description: 18-Way F (GN)

Terminal Part Information

- Pins: 1, 2, 4, 5, 6, 7, 13, 14, 15, 16
- Terminal/Tray: 7116-4618-02/14
- Core/Insulation Crimp: P/P
- Release Tool/Test Probe: J-38125-215/J-35616-64B (L-BU)

HVAC Control Module C3

Pin	Wire Color	Circuit No.	Function

1	PU/WH	1382	LED Dimming Signal
2	YE	1491	Backlight Lamp Control
3	-	-	Not Used
4	WH/BK	1236	Passenger Air Temperature Door Control B
5	L-BU/YE	1199	Driver Air Temperature Door Control B
6	D-GN	1614	Recirculation Door Control B
7	YE/WH	1318	Lower Mode Door Control B
8-12	-	-	Not Used
13	L-BU/PU	1641	Passenger Air Temperature Door Control A
14	YE/GY	1791	Driver Air Temperature Door Control A
15	TN/BK	2274	Recirculation Door Control A
16	TN	2273	Mode Door Control A
17-18	-	-	Not Used

Mode Actuator

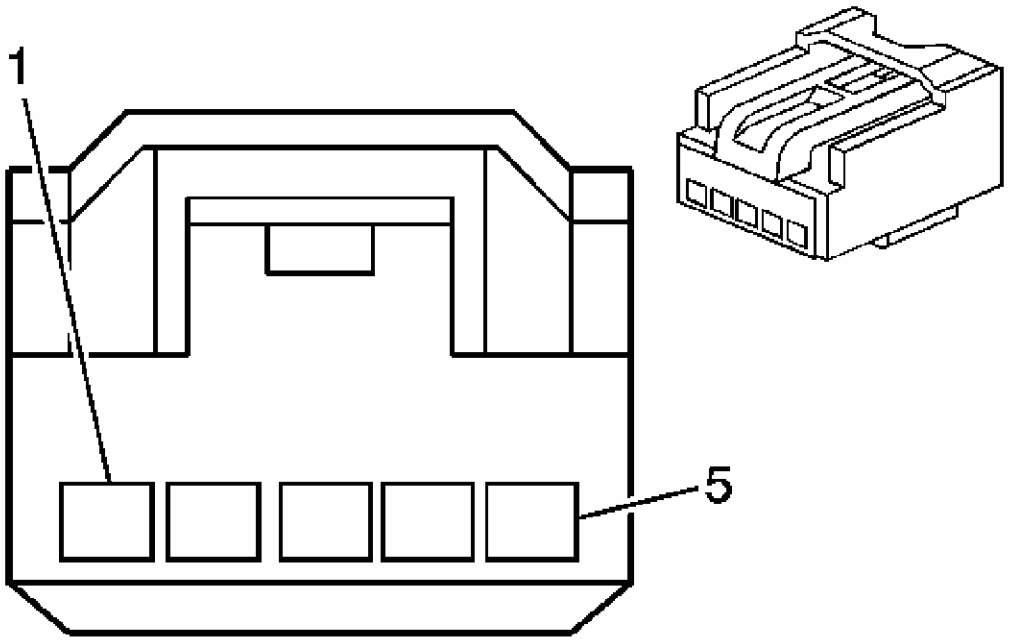


Fig. 21: Mode Actuator Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 7283-5830-30
- Service: 89046839
- Description: 5-Way F (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Mode Actuator

Pin	Wire Color	Circuit No.	Function
1	GY	598	5-Volt Reference
2	GY/BK	1798	Low Reference
3	YE/BK	1814	Lower Mode Door Position Signal
4	TN	2273	Mode Door Control A
5	YE/GN	1318	Lower Mode Door Control B

Recirculation Actuator

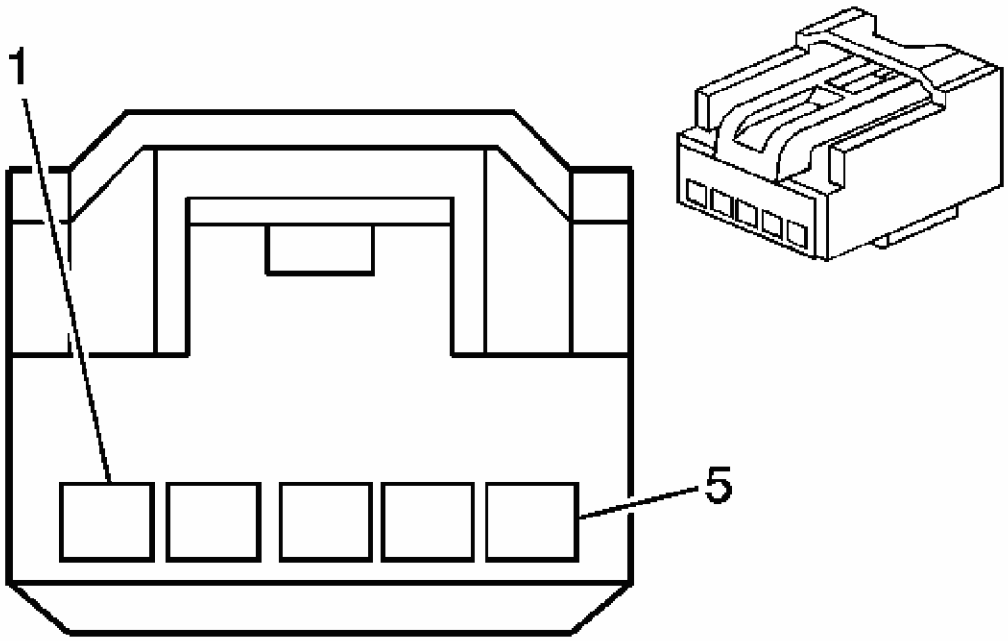


Fig. 22: Recirculation Actuator Connector End View
Courtesy of GENERAL MOTORS CORP.

HVAC Connector End Views

Connector Part Information

- OEM: 7283-5830-30
- Service: 89046839
- Description: 5-Way F (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Recirculation Actuator

Pin	Wire Color	Circuit No.	Function
1	GY	598	5-Volt Reference
2	GY/BK	1798	Low Reference
3	L-BU	706	Recirculation Valve Solenoid

			Control
4	TN/BK	2274	Recirculation Door Control A
5	D-GN	1614	Recirculation Door Control B

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC B0158	** DESCRIPTION NOT COLLECTED **
DTC B0163 or B3933	** MULTIPLE VALUES **
DTC B0183 or B0188	** MULTIPLE VALUES **
DTC B0248, B0268, B0408, B0413, B0418, B0423, B0428, B0433, B3531, B3761, B3773 or B3782	** MULTIPLE VALUES **
DTC P0530, P0532 or P0533	** MULTIPLE VALUES **
DTC P0645	**DESCRIPTION NOT COLLECTED **

SCAN TOOL OUTPUT CONTROLS

HVAC Control Module Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selections	Description
Air Inlet Door Position	HVAC Motors	When you select Outside, the HVAC control module commands the recirculation actuator toward the outside air position. When you select Recirc, the HVAC control module commands the recirculation actuator toward the recirculation position.
Blower Motor	Miscellaneous Test	When you select ON, the HVAC control module commands the blower motor relay ON. When you select OFF, the HVAC control module commands the blower motor relay OFF.
Driver Temp Door Position	HVAC Motors	When you select Cold, the HVAC control module commands the driver air temperature actuator to the full cold position. When you select Hot, the HVAC control module commands

		the actuator to the full hot position.
Mode Door Position	HVAC Motors	When you select A/C, the HVAC control module commands the mode actuator to the panel position. When you select Defrost, the HVAC control module commands the actuator to the defrost position.
Passenger Temp Door Position	HVAC Motors	When you select Cold, the HVAC control module commands the passenger air temperature actuator to the full cold position. When you select Hot, the HVAC control module commands the actuator to the full hot position.

ECM Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selections	Description
A/C Relay	Engine Output Controls	The engine must be running and the ECM must receive an A/C request from the HVAC control module in order to enable the output control. The ECM de-energizes the A/C compressor clutch relay when you select OFF. The relay remains de-energized until you select ON.

SCAN TOOL DATA LIST

HVAC Control Module Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Engine idling, A/C ON, ambient air temperature between 22-27°C (70-80°F)			
A/C Clutch - Actual	A/C Compressor Data	On/Off	On
A/C Clutch - Desired	A/C Compressor Data	Yes/No	Yes
AC Pressure	A/C Compressor Data	kPa/psi	Varies
Commanded Blower	HVAC System Data	%	Varies
Coolant Temperature	HVAC System Data	°C/°F	Varies
Driver Temp. Dr. Actual	HVAC Door Positions	Counts/Volts	Varies

Driver Temp. Dr. Commanded	HVAC Door Positions	Counts/Volts	Varies
Driver Solar Sensor	Open/Short Data	Counts/Volts	Varies
Driver Sunload	HVAC System Data	w/m2	Varies
Evaporator Temp	HVAC System Data	°C/°F	Varies
Evaporator Temp	A/C Compressor Data	°C/°F	Varies
Evaporator Temp	Open/Short Data	Counts/Volts	Varies
Mode Dr. Actual	HVAC Door Positions	Counts/Volts	Varies
Mode Dr. Commanded	HVAC Door Positions	Counts/Volts	Varies
Inside Air Temp	HVAC System Data	°C/°F	Varies
Inside Air Temp	Open/Short Data	Counts/Volts	Varies
Low Coolant Status	HVAC System Data	OK/Low	OK
Low Coolant Switch	HVAC System Data	Open/Closed	Closed
Outside Air Temp	HVAC System Data	°C/°F	Varies
Outside Air Temp	Open/Short Data	Counts/Volts	Varies
Passenger Solar Sensor	Open/Short Data	Counts/Volts	Varies
Passenger Sunload	HVAC System Data	w/m2	Varies
Passenger Temp Dr. Actual	HVAC Door Positions	Counts/Volts	Varies
Passenger Temp Dr. Commanded	HVAC Door Positions	Counts/Volts	Varies
Pressure Sensor	A/C Compressor Data	OK/Failed	OK
Vehicle Speed	HVAC System Data	Km/h/mph	Varies

ECM Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Engine idling, A/C ON, ambient air temperature between			

22-27°C (70-80°F)			
A/C High Side Pressure	Engine Data 2	kPa/Psi	629-845 kPa (85-120 psi)
A/C High Side Pressure	Engine Data 2	Volts	Varies
A/C Relay Command	Engine Data 2	On/Off	Varies
A/C Request Signal	Engine Data 2	Yes/No	Varies
ECT Sensor	Engine Data 2	°C/°F	92°C (197°F)
ECT Sensor	Engine Data 2	Volts	1.10-1.45 Volts

SCAN TOOL DATA DEFINITIONS

A/C Clutch-Actual

The scan tool displays On/Off. The HVAC control module displays On when the engine control module (ECM) transmits a class 2 message that the A/C compressor clutch relay is energized.

A/C Clutch-Desired

The scan tool displays Yes/No. The scan tool displays Yes when the HVAC control module determines that conditions for compressor clutch engagement are present.

A/C High Side Pressure

The scan tool displays 0-3450 kPa (0-500 psi). The voltage applied to the ECM input from the A/C refrigerant pressure sensor is converted to a pressure value.

A/C High Side Pressure

The scan tool displays 0-5 volts. The voltage applied to the ECM input for the A/C refrigerant pressure sensor.

A/C Pressure

The scan tool displays 0-3450 kPa (0-500 psi). The voltage applied to the ECM input from the A/C refrigerant pressure sensor is converted to a pressure value and transmitted in a class 2 message to the HVAC control module.

A/C Relay Command

The scan tool displays On/Off. The scan tool displays the control decision for the compressor clutch relay output as determined by the ECM.

A/C Request Signal

The scan tool displays Yes/No. The scan tool displays Yes when the ECM receives a class 2 message from the HVAC control module to engage the A/C compressor clutch. The scan tool displays No when the ECM receives a class 2 message from the HVAC control module to disengage the A/C compressor clutch.

Commanded Blower

The scan tool displays 0-100%. The scan tool displays the control decision for the blower motor speed as determined by the HVAC control module. The scan tool displays 100% when the blower motor is commanded to maximum speed. The scan tool displays 0% when the blower motor is commanded OFF.

Coolant Temperature

The scan tool displays -39 to +140°C (-38 to +284°F). The voltage applied to the ECM input from the engine coolant temperature sensor is converted to a temperature value and transmitted in a class 2 message to the HVAC control module.

Driver Temp Dr. Actual

The scan tool displays 0-255 counts (0-5.00 volts). The voltage applied to the driver air temperature door position input of the HVAC control module.

Driver Temp Dr. Commanded

The scan tool displays 0-255 counts (0-5.00 volts). The desired position of the driver air temperature actuator as determined by the HVAC control module.

Driver Solar Sensor

The scan tool displays 0-255 counts (0-5.00 volts). The voltage applied to the driver sunload input of the HVAC control module.

Driver Sunload

The scan tool displays 0-2000 w/m2. The voltage applied to the driver sunload input of the HVAC control module converted to light intensity units.

ECT Sensor

The scan tool displays -39 to +140°C (-38 to +284°F). The voltage applied to the ECM input from the engine coolant temperature sensor is converted to a temperature value.

ECT Sensor

The scan tool displays 0-5 volts. The voltage applied to the ECM input for the engine coolant temperature sensor.

Evaporator Temp

The scan tool displays -39 to +140°C (-38 to +284°F). The voltage applied to the HVAC control module input from the evaporator temperature sensor is converted to a temperature value.

Evaporator Temp

The scan tool displays 0-255 counts (0-5 volts). The voltage applied to the HVAC control module input for the evaporator temperature sensor.

Inside Air Temp.

The scan tool displays -40 to +215°C (-40 to +419°F). The voltage applied to the HVAC control module input for the inside air temperature sensor is converted to a temperature value.

Inside Air Temp.

The scan tool displays 0-255 counts (0-5.00 volts). The voltage applied to the HVAC control module input for the inside air temperature sensor.

Low Coolant Status

The scan tool displays OK/Low. The filtered state of the low coolant switch.

Low Coolant Switch

The scan tool displays Open/Closed. The actual state of the low coolant switch.

Mode Dr. Actual

The scan tool displays 0-255 counts (0-5.00 volts). The voltage applied to the mode door position input of the HVAC control module.

Mode Dr. Commanded

The scan tool displays 0-255 counts (0-5.00 volts). The desired position of the mode actuator as determined by the HVAC control module.

Outside Air Temp.

The scan tool displays -40 to +215°C (-40 to +419°F). The current value of the ambient air temperature display on the HVAC control module.

Outside Air Temp.

The scan tool displays 0-255 counts (0-5.00 volts). The voltage applied to the HVAC control module input for the outside air temperature sensor.

Passenger Solar Sensor

The scan tool displays 0-255 counts (0-5.00 volts). The voltage applied to the passenger sunload input of the HVAC control module.

Passenger Sunload

The scan tool displays 0-2000 w/m2. The voltage applied to the driver sunload input of the HVAC control module converted to light intensity units.

Passenger Temp Dr. Actual

The scan tool displays 0-255 counts (0-5.00 volts). The voltage applied to the passenger air temperature door position input of the HVAC control module.

Passenger Temp Dr. Commanded

The scan tool displays 0-255 counts (0-5.00 volts). The desired position of the passenger air temperature actuator as determined by the HVAC control module.

Pressure Sensor

The scan tool displays OK/Failed. The state of the A/C refrigerant pressure sensor and circuitry.

DTC B0158

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC B0158 03

Outside Air Temperature Sensor Circuit Voltage Below Threshold

DTC B0158 06

Outside Air Temperature Sensor Circuit Short to Ground or Open

DTC B0158 07

Outside Air Temperature Sensor Circuit Voltage Above Threshold

Diagnostic Fault Information

DTC B0158

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ambient Air Temperature Sensor Signal	B0158 06	B0158 06	B0158 07*	B0158 03, 07
Inside Air Temperature Sensor Signal	B0163 06	B0163 06	B0163 07*	B0163 03, 07
Left Sunload Sensor Signal	B0183	B0183	B0183*	-
Right Sunload Sensor Signal	B0188	B0188	B0188*	-
Evaporator Temperature Sensor Signal	B3933 06	B3933 06	B3933 06*	-
Low Reference	-	B3933 06, B0158 06, B0163 06	B3933 06, B0158 07, B0163 07	B0158 07, B0163 07
Sunload sensors Ground Circuit	-	B0183, B0188	B0183, B0188	-
* If a signal circuit is shorted to voltage B0158, B0163, B0183, B0188 and B3933 will all set.				

Circuit/System Description

The HVAC control module supplies the ambient air temperature sensor with a low reference circuit and 5-volt signal circuit. The HVAC control module determines the voltage drop across the sensor, which is proportional to temperature. As the air temperature increases, the sensor resistance decreases and the voltage signal decreases. As the air temperature decreases, the sensor resistance increases and the voltage signal increases.

Conditions for Running the DTC

The ignition is turned ON.

Conditions for Setting the DTC

The HVAC control module detects the ambient air temperature sensor signal circuit is less than -36°C (-38°F) or more than 215°C (419°F) for more than 15 seconds.

Action Taken When the DTC Sets

- The HVAC control module will display dashes for outside air temperature.
- The DIC will display SERVICE A/C SYSTEM.
- The system operates using a default value.

Conditions for Clearing the DTC

- The DTC will become history if the HVAC control module no longer detects the condition that set the DTC.
- The history DTC will clear after 50 fault-free ignition cycles.

Reference Information

Schematic Reference

HVAC Schematics

Connector End View Reference

HVAC Connector End Views

Description and Operation

Air Temperature Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

- Scan Tool Output Controls
- Scan Tool Data List
- Scan Tool Data Definitions

Circuit/System Testing

NOTE: **If the outside (ambient) air temperature sensor has an out of range condition caused by a short to voltage, short to ground or open/high resistance the scan tool will display the last normal operating range.**

1. Ignition OFF, disconnect the harness connector at the outside air temp sensor.
2. Ignition OFF, test for less than 1 ohm of resistance between the low reference circuit B and ground.
   - If greater than the specified range, test the low reference circuit for an open/high resistance. If the circuit tests normal, replace the HVAC control module.
3. Ignition ON, test for 5 volts between the low reference circuit terminal B and the 5-volt reference signal circuit terminal A.
   - If not the specified voltage, test the signal circuit for a short to voltage, short to ground or open/high resistance. If the circuit tests normal, replace the HVAC control module.
4. If all circuits test normal, test or replace the outside air temperature sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Ambient Air Temperature Sensor Replacement**
- **Control Module References** for HVAC control module replacement, setup and programming

DTC B0163 OR B3933

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B0163 03

Passenger Compartment Temperature Sensor Circuit Below Threshold

DTC B0163 06

Passenger Compartment Temperature Sensor Circuit Short to Ground or Open

DTC B0163 07

Passenger Compartment Temperature Sensor Circuit Above Threshold

DTC B3933

Evaporator Temperature Sensor Circuit

Diagnostic Fault Information

DTC B0163 or B3933

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ambient Air Temperature Sensor Signal	B0158 06	B0158 06	B0158 07	B0158 03, 07
Inside Air Temperature Sensor Signal	B0163 06	B0163 06	B0163 07	B0163 03, 07
Left Sunload Sensor Signal	B0183	B0183	B0183	-
Right Sunload Sensor Signal	B0188	B0188	B0188	-
Evaporator Temperature Sensor Signal	B3933 06	B3933 06	B3933 06	-
Low Reference	-	B3933 06, B0158 06, B0163 06	B3933 06, B0158 07, B0163 07	B0158 07, B0163 07
Sunload sensors Ground Circuit	-	B0183, B0188	B0183, B0188	-

Circuit/System Description

The HVAC control module supplies the evaporator temperature and inside air temperature sensors with a low reference circuit and 5-volt signal circuit. The HVAC control module determines the voltage drop across the sensors, which is proportional to temperature. As the air temperature increases, the sensor resistance decreases and the voltage signal decreases. As the air temperature decreases, the sensor resistance increases and the voltage signal increases. The inside air temperature sensor assembly has an internal fan that draws air across the sensor and is controlled by the HVAC control module. The internal fan motor is connected to body ground.

Conditions for Running the DTC

The ignition is turned ON.

Conditions for Setting the DTC

B0163

The HVAC control module detects the inside air temperature sensor signal circuit is less than -36°C (-38°F) or more than 215°C (419°F) for more than 15 seconds.

B3933

The HVAC control module detects the evaporator temperature sensor signal circuit is less than -36°C (-38°F) or more than 215°C (419°F) for more than 15 seconds.

Action Taken When the DTC Sets

B0163

- The system operates using a default value.
- The HVAC control module will display dashes for outside air temperature.
- The DIC will display SERVICE A/C SYSTEM.

B3933

- The A/C compressor is disabled
- The HVAC control module will display dashes for outside air temperature.
- The DIC will display SERVICE A/C SYSTEM.

Conditions for Clearing the DTC

- The DTC will become history if the HVAC control module no longer detects the condition that set the DTC.
- The history DTC will clear after 50 fault-free ignition cycles.

Diagnostic Aids

If DTCs B0158, B0163, B0183, B0188 and B3933 are all set inspect the signal circuit for a short to voltage. If the circuit tests normal replace the HVAC control module.

Reference Information

Schematic Reference

HVAC Schematics

Connector End View Reference

HVAC Connector End Views

Description and Operation

Air Temperature Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

- Scan Tool Output Controls
- Scan Tool Data List
- Scan Tool Data Definitions

Circuit/System Testing

1. Ignition OFF, disconnect the appropriate temp sensor harness connector at the sensor.
2. Ignition OFF, test for less than 1 ohm of resistance between the ground circuit and the low reference circuit terminal of the appropriate sensor listed below.
    - DTC B0163 passenger compartment temperature sensor circuit terminal D.
    - DTC B3933 evaporator temperature sensor circuit terminal B.
    - If greater than the specified range, test the low reference circuit terminal for an open/high resistance. If the circuit tests normal, replace the HVAC control module.
3. Ignition ON, verify the appropriate sensor parameter is greater than 215°C (419°F).
    - If less than the specified range, test the signal circuit terminal A for a short to ground. If the circuit tests normal, replace the HVAC control module.
4. Install a 3A fused jumper wire between the signal circuit terminal A and the low reference circuit terminal of the appropriate sensor listed below. Verify the appropriate temperature sensor parameter is less than -36°C (-38°F).
    - DTC B0163 passenger compartment temperature sensor circuit terminal D.
    - DTC B3933 evaporator temperature sensor circuit terminal B.
    - If greater than the specified range, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the HVAC control module.
5. If all circuits test normal, test or replace the appropriate temperature sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Scan Tool Data Definitions**
- **Heater and Air Conditioning Control Wiring Harness Replacement (w/Evaporator Temperature Sensor)**
- **Inside Air Temperature Sensor Replacement**
- **Control Module References** for HVAC control module replacement, setup and programming

DTC B0183 OR B0188

Circuit Description

The sunload sensor is a 2-wire photo diode. The vehicle uses left and right sunload sensors. The 2 sensors are integrated into the sunload sensor assembly along with the ambient light sensor. Low reference and signal circuits enable the sensor to operate. As the sunload increases, the sensor signal decreases. The sensor operates within an intensity range between completely dark and bright. The sensor signal varies between 0-5 volts. The HVAC control module converts the signal to a range between 0-255 counts. The sunload sensor provides the HVAC control module a measurement of the amount of light shining on the vehicle. Bright or high intensity, light causes the vehicles inside temperature to increase. The HVAC system compensates for the increased temperature by diverting additional cool air into the vehicle.

- Solar Load Sensor 1 Circuit refers to the left sunload sensor
- Solar Load Sensor 2 Circuit refers to the right sunload sensor

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC B0183 Solar Load Sensor 1 Circuit
- DTC B0188 Solar Load Sensor 2 Circuit

This vehicle has DTCs which include DTC Symptoms. For more information on DTC Symptoms, refer to **DTC Symptom Description** .

DTC B0183 or B0188

DTC Symptom	DTC Symptom Descriptor
00	Out of Range Condition

Conditions for Running the DTC

The ignition is turned ON.

Conditions for Setting the DTC

The HVAC control module detects the signal circuit is less than 0.09 volt (5 counts) or more than 4.90 volts (250 counts).

Action Taken When the DTC Sets

- If the DTC is set the system will act as if no sunload condition exists.
- The driver information center (DIC) will display SERVICE A/C SYSTEM.

Conditions for Clearing the DTC

- The DTC will become history if the HVAC control module no longer detects a failure.
- The history DTC will clear after 50 fault-free ignition cycles.
- The DTC can be cleared with a scan tool.

DTC B0248, B0268, B0408, B0413, B0418, B0423, B0428, B0433, B3531, B3761, B3773 OR B3782 B3782

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC B0248 61

Air Flow Control 3 Circuit Actuator Stuck

DTC B0268 61

Air Flow Control 7 Circuit Actuator Stuck

DTC B0408 61

Temperature Control 1 Circuit Actuator Stuck

DTC B0413 06

Temperature Control 1 Feedback Circuit Short to Ground or Open

DTC B0418 61

Temperature Control 2 Circuit Actuator Stuck

DTC B0423 06

Temperature Control 2 Feedback Circuit Short to Ground or Open

DTC B3761 06

Air Flow Control 3 Feedback Circuit Short to Ground or Open

DTC B3773 06

Air Flow Control 7 Feedback Circuit Short to Ground or Open

Diagnostic Fault Information

DTC B0248, B0268, B0408, B0413, B0418, B0423, B0428, B0433, B3531, B3761, B3773 or B3782

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Recirculation Door Control A Circuit	B0268 61	B0268 61	-	-
Recirculation Door Control B Circuit	B0268 61	B0268 61	-	-
Recirculation Door Position Signal	B0268 61	B3773 06	B0268 61 B3773 06	-
Recirculation 5-Volt Reference Circuit	B0248 61 B0408 61 B0418 61 B0268 61	B3773 06	B0268 61 B3773 06	-
Recirculation Low Reference Circuit	-	B0268 61	-	-
Driver Air Temperature Door Control A Circuit	B0408 61	B0408 61	-	-
Driver Air Temperature Door Control B Circuit	B0408 61	B0408 61	-	-
Driver Air Temperature Door Position Signal	B0408 61	B0413 06	B0408 61 B0413 06	-
Driver Air Temperature 5-Volt Reference Circuit	B0248 61 B0408 61 B0418 61 B0268 61	B0413 06	B0408 61 B0413 06	-
Driver Air Temperature Low Reference Circuit	-	B0408 61	-	-

Passenger Air Temperature Door Control A Circuit	B0418 61	B0418 61	-	-
Passenger Air Temperature Door Control B Circuit	B0418 61	B0418 61	-	-
Passenger Air Temperature Door Position Signal	B0418 61	B0268 61 B0423 06	B0418 61	-
Passenger Air Temperature 5-Volt Reference Circuit	B0248 61 B0408 61 B0418 61 B0268 61	B0418 61	B0268 61 B0423 06	-
Passenger Air Temperature Low Reference Circuit	-	B0418 61	-	-
Mode Door Control A Circuit	B0248 61	B0248 61	-	-
Mode Door Control B Circuit	B0248 61	B0248 61	-	-
Mode Door Position Signal	B0248 61	B0248 61 B3761 06	B0248 61 B3761 06	-
Mode 5-Volt Reference Circuit	B0248 61 B0408 61 B0418 61 B0268 61	B0248 61	B0248 61 B3761 06	-
Mode Low Reference Circuit	-	B0248 61	-	-

Circuit/System Description

The HVAC control module controls the HVAC door actuators to regulate the airflow through the HVAC system. Each actuator consists of an electric motor and a potentiometer. The module supplies a low reference and 5-volt reference source voltage to the potentiometer. The HVAC control module monitors the voltage drop across the potentiometer on the door position signal circuit. When the actuator shaft rotates, the voltage on the door position signal circuit changes. The HVAC control module supplies the actuator motor with a 12-volt control circuit and a ground control circuit. The HVAC module controls the direction of the actuator door by changing the polarity of the control circuits.

Conditions for Running the DTC

- The ignition is ON.
- Ignition voltage is between 9-16 volts.
- The HVAC module is ON.

Conditions for Setting the DTC

The actual door position differs from the commanded door position by more than 4 counts or the HVAC control module detects the door position signal circuit is less than 7 counts or greater than 250 counts.

Action Taken When the DTC Sets

Driver A and driver B circuits are deactivated for the appropriate actuator.

Conditions for Clearing the DTC

- The DTC becomes history when the HVAC control module no longer detects the condition that set the DTC.
- The history DTC will clear after 50 fault free ignition cycles.
- The DTC can be cleared with a scan tool.

Reference Information

Schematic Reference

HVAC Schematics

Connector End View Reference

HVAC Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

- **Scan Tool Data List**
- **Scan Tool Output Controls**

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the appropriate actuator.
2. Ignition OFF, test for less than 1.0 ohm of resistance between the low reference circuit terminal 2 and ground.
    - If greater than the specified range, test the low reference circuit for an open/high

resistance. If the circuit tests normal, replace the HVAC control module.

3. Ignition ON, test for 4.8-5.2 volts between the 5-volt reference circuit terminal 1 and ground.
   - If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the HVAC control module.
   - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the HVAC control module.
4. Verify the appropriate scan tool parameter is less than 3 counts.
   - If greater than the specified range, test the signal circuit terminal 3 for a short to ground. If the circuit tests normal, replace the HVAC control module.
5. Install a 3A fused jumper wire between the signal circuit terminal 3 and the low reference circuit terminal 2. Verify the appropriate scan tool actuator parameter is greater than 250 counts.
   - If less than the specified range, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the HVAC control module.
6. Reconnect the harness connector at the appropriate actuator.
7. Disconnect the HVAC control module.

IMPORTANT: Apply power and ground to the actuator for no more than 2 seconds at a time or the actuator could be damaged.

IMPORTANT: When performing the following tests, make sure that the device is not already at its end of travel position by switching the polarity applied to the actuator twice if the actuator did not move in one direction.

8. Install a 20 amp fused jumper wire between the appropriate control circuit terminal and 12 volts. Momentarily install a jumper wire between the appropriate control circuit terminal and ground. The actuator should move.
   - If the actuator does not move in both directions, test the control circuits for a short to voltage, short to ground or an open/high resistance. If the circuits test normal, test or replace the inoperative actuator.
9. If all circuits test normal, replace the HVAC control module.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **HVAC Control Module Programming and Setup**

- **Recirculation Actuator Replacement**
- **Mode Actuator Replacement**
- **Air Temperature Actuator Replacement - Left Side**
- **Air Temperature Actuator Replacement - Right Side**

DTC P0530, P0532 OR P0533

Circuit Description

The powertrain control module (PCM) monitors the high side refrigerant pressure through an A/C refrigerant pressure sensor. When the pressure is high, the signal voltage is high. When the pressure is low, the signal voltage is low. When pressure is high, the PCM commands the cooling fans on. When pressure is too high or too low, the PCM will not allow the A/C compressor clutch to engage. The PCM sends the A/C pressure data to the dash integration module (DIM) over the class 2 serial data circuit. The DIM will command the inline A/C orifice solenoid to increase or decrease the high side pressure. This keeps the high side pressure in a normal operating range. This will prevent the A/C compressor clutch from disengaging under normal operating conditions. The DIM will not request A/C compressor clutch engagement if the A/C pressure is too high.

DTC Descriptors

This diagnostic procedure supports the following DTCs:

- DTC P0530 Air Conditioning (A/C) Refrigerant Pressure Sensor Circuit
- DTC P0532 Air Conditioning (A/C) Refrigerant Pressure Sensor Circuit Low Voltage
- DTC P0533 Air Conditioning (A/C) Refrigerant Pressure Sensor Circuit High Voltage

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

- A/C pressure of less than 0.3 volts or more than 4.92 volts.
- The condition must be present for more than 5 seconds.

Action Taken When the DTC Sets

- The PCM will not illuminate the malfunction indicator lamp (MIL).
- The PCM will store the conditions present when the DTC set as Fail Records data only.

Conditions for Clearing the DTC

- The history DTC will clear after 40 consecutive warm-up cycles have occurred without a malfunction.
- The DTC can be cleared by using the scan tool Clear DTC Information function.

Diagnostic Aids

Test the following conditions:

- Visually inspect the sensor for contamination or damage.
- Inspect for the following that may affect the sensors accuracy:
  - A malfunction within the refrigerant system causing low pressure
  - Visually inspect the A/C components and lines for damage.
- Refer to **Testing for Intermittent Conditions and Poor Connections** .

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4: Tests for the proper operation of the circuit in the low voltage range.

5: Tests for the proper operation of the circuit in the high voltage range. If the fuse in the jumper opens when you perform this test, the signal circuit is shorted to ground.

6: Tests for a short to voltage in the 5-volt reference circuit.

7: Tests for a high resistance or an open in the low reference circuit.

DTC P0530, P0532 or P0533

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views**				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	**IMPORTANT:** **The ambient air temperature must be above 3°C (38°F).** 1. Turn OFF the ignition. 2. Inspect the A/C compressor for free rotation operation. 3. Start the engine.	-	Go to **HVAC**	

	4. Place the HVAC control module in the OFF position. Does the A/C compressor operate?		**Compressor Clutch Does Not Disengage**	Go to **Step 3**
3	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the A/C High Side Pressure parameter in the Powertrain Control Module Engine Data 2 list. Does the scan tool indicate that the A/C High Side Pressure parameter is within the specified range?	0.1-4.9 V	Go to Diagnostic Aids	Go to **Step 4**
4	1. Turn OFF the ignition. 2. Disconnect the A/C refrigerant pressure sensor. 3. Turn ON the ignition, with the engine OFF. 4. With a scan tool, observe the A/C High Side Pressure parameter in the Powertrain Control Module Engine Data 2 list. Does the scan tool indicate that the A/C High Side Pressure parameter is less than the specified value?	0.1 V	Go to **Step 5**	Go to **Step 11**
5	1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the 5-volt reference circuit of the A/C refrigerant pressure sensor and the signal circuit of the A/C refrigerant pressure sensor. 3. Turn ON the ignition, with the engine OFF.	4.9 V		

	4. With a scan tool, observe the A/C High Side Pressure parameter in the Powertrain Control Module Engine Data 2 list. Does the scan tool indicate that the A/C High Side Pressure parameter is greater than the specified value?		Go to **Step 6**	Go to **Step 9**
6	1. Disconnect the fused jumper wire. 2. Measure the voltage between the 5-volt reference circuit of the A/C refrigerant pressure sensor and the low reference circuit of the A/C refrigerant pressure sensor. Does the voltage measure less than the specified value?	4.9 V	Go to **Step 7**	Go to **Step 8**
7	1. Turn OFF the ignition. 2. Disconnect the negative battery cable. 3. Measure the resistance from the low reference circuit of the A/C refrigerant pressure sensor to a good ground. Does the resistance measure less than the specified value?	5 ohm	Go to **Step 13**	Go to **Step 12**
8	Test the 5-volt reference circuit of the A/C refrigerant pressure sensor for a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 14**
	Test the 5-volt reference circuit of the A/C refrigerant pressure sensor for the following:			

9	• A short to ground • A high resistance • An open Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 10**
10	Test the signal circuit of the A/C refrigerant pressure sensor for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 14**
11	Test the signal circuit of the A/C refrigerant pressure sensor for a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 14**
12	1. Disconnect the HVAC control module. 2. Test the low reference circuit of the A/C refrigerant pressure sensor for a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 14**
13	Inspect for poor connections at the harness connector of the A/C refrigerant pressure sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 15**

14	Inspect for poor connections at the harness connector of the powertrain control module (PCM). Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 17**	Go to **Step 16**
15	Replace the A/C refrigerant pressure sensor. Refer to **Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (LD8)** or **Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (L26)** . Did you complete the replacement?	-	Go to **Step 17**	-
16	Replace the PCM. Refer to **Control Module References** for replacement, setup and programming. Did you complete the replacement?	-	Go to **Step 17**	-
17	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 2**	System OK

DTC P0645

Circuit Description

Ignition voltage is supplied directly to the A/C compressor clutch relay. The engine control module (ECM) controls the relay by grounding the A/C clutch relay control circuit via an internal solid state device called a driver. The primary function of the driver is to supply the ground for the component being controlled. The driver has a fault line which is monitored by the ECM. When the ECM is commanding a component ON, the voltage of the control circuit should be near 0 volts. When the ECM is commanding the control circuit to a component OFF,

the voltage potential of the circuit should be near battery voltage. If the fault detection circuit senses a voltage other than what is expected, this DTC will set.

The ECM will monitor the control circuit for the following:

- A short to ground
- A short to voltage
- An open circuit
- An open relay coil
- An internally shorted or excessively low resistance relay coil

When the ECM detects any of the above malfunctions, this DTC is set and the affected driver is disabled.

DTC Descriptors

This diagnostic procedure supports the following DTC:

DTC P0645 Air Conditioning (A/C) Clutch Relay Control Circuit

Conditions for Running the DTC

- The ignition voltage is between 9-18 volts.
- The engine speed is more than 80 RPM.
- The ECM driver transitions from ON to OFF or from OFF to ON.

Conditions for Setting the DTC

The ECM detects an open on the control circuit of the A/C compressor clutch relay.

Action Taken When the DTC Sets

- The ECM will not illuminate the malfunction indicator lamp (MIL).
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.

Conditions for Clearing the DTC

- A History DTC clears after 40 consecutive warm-up cycles have occurred without a malfunction.
- The DTC can be cleared by using a scan tool.

Diagnostic Aids

IMPORTANT: Be sure to verify that the ECM engine grounds are secure and clean.

If DTC P0645 cannot be duplicated, reviewing the Failure Records vehicle millage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

If the condition is not present, refer to **Testing for Intermittent Conditions and Poor Connections** .

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Listen for an audible click when the A/C compressor clutch relay operates. Command both the ON and OFF states. Repeat the commands as necessary.

3: This step tests for voltage at the coil side of the A/C compressor clutch relay. The 10-amp fuse supplies power to the coil side of the A/C compressor clutch relay.

4: This step verifies that the engine control module is providing ground to the A/C compressor clutch relay. If light always on circuit shorted to ground.

8: This step tests for a short to voltage or an open.

10: If the A/C fuse is open be sure to test the A/C compressor clutch supply voltage circuit for a short to ground.

DTC P0645

Step	Action	Yes	No
Schematic Reference: HVAC Schematics Connector End View Reference: HVAC Connector End Views			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, command the A/C Relay ON and OFF in the engine control module (ECM) Special Functions, Engine Output Controls list.	Go to **Testing for Intermittent Conditions**	

	Does the A/C Relay turn ON and OFF with each command?	**and Poor Connections**	Go to **Step 3**
3	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the battery positive voltage circuit of the A/C compressor clutch relay with a test lamp that is connected to a good ground. Does the test lamp illuminate?	Go to **Step 4**	Go to **Step 8**
4	1. Connect a test lamp between the control circuit of the A/C compressor clutch relay and the battery positive voltage circuit of the A/C compressor clutch relay. 2. Start the engine. 3. With a scan tool, command the A/C Relay ON and OFF. Does the test lamp turn ON and OFF with each command?	Go to **Step 6**	Go to **Step 5**
5	Test the control circuit of the A/C compressor clutch relay for a short to ground, short to voltage or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 11**	Go to **Step 7**
6	Inspect for poor connections at the A/C compressor clutch relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and**Connector Repairs** . Did you find and correct the condition?	Go to **Step 11**	Go to **Step 9**
7	Inspect for poor connections at the harness connector of the engine control module (ECM). Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** .		

	Did you find and correct the condition?	Go to **Step 11**	Go to **Step 10**
8	Repair the battery positive voltage circuit of the A/C compressor clutch relay. Refer to **Wiring Repairs** . Did you complete the repair?	Go to **Step 11**	-
9	Replace the A/C compressor clutch relay. Did you complete the replacement?	Go to **Step 11**	-
10	Replace the ECM. Refer to **Control Module References** for replacement, setup and programming. Did you complete the replacement?	Go to **Step 11**	-
11	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to **Step 2**	System OK

SYMPTOMS - HVAC SYSTEMS - AUTOMATIC

IMPORTANT: The following steps must be completed before using the symptom tables.

1. Perform the **Diagnostic System Check - Vehicle** , before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to the following procedures:
   - **Air Delivery Description and Operation**
   - **Air Temperature Description and Operation**

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the HVAC System. Refer to **Checking Aftermarket Accessories** .
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Verify the A/C compressor clutch turns freely and is not seized.

- Verify that the customer is using the correct key to enable personalization and is not inadvertently activating steering wheel or passenger HVAC controls.
- The A/C compressor will not operate in cold outside air temperatures. Refer to **Air Temperature Description and Operation**.
- The following conditions may cause window fogging:
  - Wet carpet or mats
  - High humidity
  - Interior water leak
  - Blocked A/C evaporator drain tube
  - Maximum passenger capacity
  - Blocked body pressure relief valves
- Inspect the air distribution system for causes of reduced air flow:
  - Obstructed or dirty passenger compartment air filter, if equipped
  - Blocked or damaged air inlet or outlet vents

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections** .

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **HVAC Compressor Clutch Does Not Engage**
- **HVAC Compressor Clutch Does Not Disengage**
- **Blower Motor Malfunction**
- **Too Hot in Vehicle**
- **Too Cold in Vehicle**
- **Air Delivery Improper**
- **Air Recirculation Malfunction**
- **Leak Testing**
- **Heating Performance Diagnostic**
- **Noise Diagnosis - Blower Motor**
- **Noise Diagnosis - Air Conditioning (A/C) System**
- **Odor Diagnosis**

HVAC COMPRESSOR CLUTCH DOES NOT ENGAGE

HVAC Compressor Clutch Does Not Engage

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The A/C compressor clutch will not engage when an A/C request has been made and a Powertrain DTC has not been set.				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Start the engine. 2. Place the blower motor switch in the maximum speed position. 3. Ensure the A/C OFF switch is not selected. 4. Place the left air temperature switch in the coldest position. Does the A/C compressor operate?	-	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 3**
3	1. Start the engine. 2. Observe the coolant temperature indicator. Is the engine coolant temperature indicator illuminated?	-	Go to **Diagnostic System Check - Vehicle**	Go to **Step 4**
4	1. Turn OFF the ignition. 2. Install the ACR 2000. 3. Record the ambient temperature at the vehicle. 4. Record readings of the low and high side STATIC pressures. 5. Compare the low and the high side pressure values with the allowable limits for the recorded ambient air temperature.	Above 16° C (60°F) 345 kPa (50 psi) Above 24° C (75°F) 483 kPa (70 psi) Above 33° C (90°F)		

	Are the low and the high side pressure values within the allowable limits for the recorded ambient air temperature and are the pressure values within 103 kPa (15 psi) of each other?	690 kPa (100 psi)	Go to **Step 5**	Go to **Leak Testing**
5	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool observe the A/C refrigerant pressure sensor in the engine control module (ECM) data list. 4. Compare the A/C refrigerant pressure sensor parameter on the scan tool with the ACR 2000 high side pressure value. Is the scan tool A/C refrigerant pressure sensor parameter and the ACR 2000 pressure value within 15 psi of each other?	-	Go to **Step 6**	Go to **Step 14**
6	With a scan tool, view the evaporator temperature in the HVAC system data. Is the evaporator temperature below 4°C (39°F)?	-	Go to **Step 17**	Go to **Step 7**
7	With a scan tool, view the ambient air temperature in the HVAC system data. Is the ambient air temperature below 3°C (38°F)?	-	Go to **Step 18**	Go to **Step 8**
8	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch. 3. Turn ON the ignition, with the engine OFF. 4. Probe the supply voltage circuit of the A/C compressor clutch with a test lamp that is	-		

	connected to ground. 5. With a scan tool, command the A/C compressor clutch relay ON. Does the test lamp illuminate?		Go to **Step 9**	Go to **Step 10**
9	Test the ground circuit of the A/C compressor clutch for a high resistance or for an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 13**
10	Test the voltage supply circuit of the A/C compressor clutch for a high resistance or for an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 11**
11	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the battery positive voltage circuit of the A/C compressor clutch relay with a test lamp that is connected to ground. Does the test lamp illuminate?	-	Go to **Step 12**	Go to **Step 25**
12	Inspect for poor connections at the A/C compressor clutch relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 26**
	Inspect for poor connections at the			

13	harness connector of the A/C compressor clutch. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 27**
14	1. Disconnect the A/C pressure sensor. 2. With a test lamp connected to battery voltage, probe the ground circuit at the A/C pressure sensor connector. Does the test lamp illuminate?	-	Go to **Step 19**	Go to **Step 15**
15	Test the ground circuit of the A/C refrigerant pressure sensor for a high resistance or for an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 16**
16	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 28**
17	Inspect the evaporator temperature sensor circuits for high resistance. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 21**
18	Inspect the outside air temperature sensor circuits for high resistance. Refer to **Circuit Testing** and **Wiring Repairs** .	-		Go to **Step**

	Did you find and correct the condition?		Go to **Step 29**	**22**
19	Inspect for poor connections at the harness connector of the A/C pressure sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 20**
20	Replace the A/C refrigerant pressure sensor. Refer to **Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (LD8)** or **Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (L26)** . Did you complete the replacement?	-	Go to **Step 29**	-
21	Inspect for poor connections at the harness connector of the evaporator temperature sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 23**
22	Inspect for poor connections at the harness connector of the ambient air temperature sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 29**	Go to **Step 24**
23	Replace the evaporator temperature sensor. Refer to **Heater and Air Conditioning Control Wiring Harness Replacement (w/Evaporator**	-		

Step	Action	Values	Yes	No
	Temperature Sensor) . Did you complete the replacement?		Go to Step 29	-
24	Replace the ambient air temperature sensor. Refer to **Ambient Air Temperature Sensor Replacement** Did you complete the replacement?	-	Go to **Step 29**	-
25	Repair the battery positive voltage circuit of the A/C compressor clutch relay. Refer to **Wiring Repairs** Did you complete the repair?	-	Go to **Step 29**	-
26	Replace the A/C compressor clutch relay. Did you complete the replacement?	-	Go to **Step 29**	-
27	Replace the A/C compressor clutch. Refer to **Compressor Replacement (LD8)** or **Compressor Replacement (L26)** Did you complete the replacement?	-	Go to **Step 29**	-
28	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup and programming. Did you complete the replacement?	-	Go to **Step 29**	-
29	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 2**

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The A/C compressor clutch will not engage when an A/C request has been made and a Powertrain DTC has not been set.				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Start the engine. 2. Place the blower motor switch in the maximum speed position. 3. Ensure the A/C OFF switch is not selected. 4. Place the left air temperature switch in the coldest position. Does the A/C compressor operate?	-	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to Step
3	1. Start the engine. 2. Observe the coolant temperature indicator. Is the engine coolant temperature indicator illuminated?	-	Go to **Diagnostic System Check - Vehicle**	Go to Step

HVAC COMPRESSOR CLUTCH DOES NOT DISENGAGE

HVAC Compressor Clutch Does Not Disengage

Step	Action	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The A/C compressor clutch will not disengage when an A/C request has			

not been made and a Powertrain DTC has not been set.			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Start the engine. 2. Place the A/C request switch in the OFF position. Is the A/C compressor clutch still engaged?	Go to **Step 3**	Go to **Testing for Intermittent Conditions and Poor Connections**
3	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch. 3. Turn ON the ignition, with the engine OFF. 4. Probe the supply voltage circuit of the A/C compressor clutch with a test lamp that is connected to ground. Does the test lamp illuminate?	Go to **Step 4**	Go to **Step 6**
4	Test the supply voltage circuit of the A/C compressor clutch for a short to voltage. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 9**	Go to **Step 5**
5	Inspect for poor connections at the A/C compressor clutch relay. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 9**	Go to **Step 7**
6	Inspect for poor connections at the harness connector of the A/C compressor clutch. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** .		

	Did you find and correct the condition?	Go to **Step 9**	Go to **Step 8**
7	Replace the A/C compressor clutch relay. Refer to **Relay Replacement (Within an Electrical Center)** or **Relay Replacement (Attached to Wire Harness)** . Did you complete the replacement?	Go to **Step 9**	-
8	Replace the A/C compressor. Refer to **Compressor Replacement (LD8)** or **Compressor Replacement (L26)** . Did you complete the replacement?	Go to **Step 9**	-
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

BLOWER MOTOR MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Diagnostic Fault Information

Blower Motor Malfunction

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Blower motor control module battery positive voltage	1	1	2	-
Blower motor speed control	2	1	1	-
High blower motor relay control	2	1	1	-
Front blower motor low reference	1	1	1	-
Blower motor control ground	-	1	1	-
1. Blower motor inoperative 2. Blower motor always ON				

Circuit/System Description

Blower Motor Control Module

The blower motor control module is an interface between the HVAC control module and the blower motor. The blower motor speed control, battery positive and ground circuits enable the control module to operate. The HVAC control module provides a pulse width modulation (PWM) signal to the blower motor control module in order to command the blower motor speed. The control processor uses the blower motor ground or low reference as a low side control to adjust the blower motor speed.

Air Speed

The blower motor forces air to circulate within the vehicles interior. The vehicle operator determines the blower motors speed by placing the blower knob dial in a desired speed position or by selecting automatic operation. In manual operation, the blower has six speed selections. The HVAC control module may alter the blower motor speed due to compensating factors. In automatic operation, the HVAC control module will determine what blower speed is necessary in order to achieve or maintain a desired temperature. In manual and automatic operation, the blower speed temporarily reduces speed during transition between outlet modes.

Reference Information

Schematic Reference

HVAC Schematics

Connector End View Reference

HVAC Connector End Views

Description and Operation

Air Delivery Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Circuit/System Verification

1. Ignition ON, switch the Climate Control System to the manual setting. Turn the fan speed control knob from the lowest to highest setting. The blower motor speed should change

between commanded states.

2. Turn the blower speed control knob to the "O" position. The blower motor should turn OFF.

Circuit/System Testing

1. Ignition OFF, disconnect the FRT HVAC BLWR relay.
2. Ignition ON, verify that a test lamp does not illuminate between the B+ circuit terminal 134 and ground.
   - If the test lamp illuminates, test the B+ circuit for a short to voltage
3. Verify that a test lamp illuminates between the B+ circuit terminal 135 and ground.
   - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance.
4. Verify that a test lamp illuminates between the B+ circuit terminal 138 and ground.
   - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance. If the circuit test normal and the HVAC BLWR fuse is open, test the B+ circuit for a short to ground. If the circuit tests normal, replace the blower motor control module.
5. Connect a test lamp between the control circuit 137 and the B+ circuit 135.
6. Command the blower motor ON and OFF. The test lamp should turn ON and OFF when changing between the commanded states.
   - If the test lamp is always OFF, test the control circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the HVAC control module.
   - If test lamp is always ON, test for short to ground. If circuit tests normal, replace the blower motor control module.
7. Connect the FRT HVAC BLWR relay.
8. Disconnect the harness connector at the blower motor control module.
9. Test for less than 1.0 ohm of resistance between the ground circuit terminal 4 and ground.
   - If not the specified range, test the ground circuit for an open/high resistance.
10. Connect a test lamp between the B+ circuit terminal 2 and ground.
11. Turn ON the blower motor. Verify the test lamp illuminates.
    - If the test lamp does not illuminate, test the B+ circuit for an open/high resistance. If the circuit tests normal, test or replace the FRT HVAC BLWR relay.
12. Install a test lamp between the control circuit terminal 3 and B+.
13. Turn the blower motor ON and cycle between low and high speeds. The test lamp should dimly illuminate at high speeds and reduce in intensity as the blower speed is reduced.
    - If the test lamp does not illuminate, test the control circuit for short to voltage or an open/high resistance. If the circuits test normal, test or replace the HVAC control

module.
    - If the test lamp does not change intensity, test the control circuit for a short to ground. If the circuit tests normal, test or replace the HVAC control module.
14. Connect the harness connector at the blower motor control module.
15. Disconnect the harness connector at the blower motor.
16. Install at test lamp between the B+ circuit terminal 1 and ground.
17. Turn ON the blower motor. Verify the test lamp illuminates.
    - If the test lamp does not illuminate, test the B+ circuit for an open/high resistance.
18. Install a test lamp between the control circuit terminal 1 and the low reference circuit terminal 2.
19. Turn the blower motor ON and cycle between low and high speeds. The test lamp should illuminate and change in intensity as the blower speed is varied.
    - If the test lamp does not illuminate, test the low reference circuit for short to voltage or an open/high resistance. If the circuit test normal, test or replace the blower motor control module.
    - If the test lamp does not change intensity, test the low reference circuit for a short to ground. If the circuit tests normal, test or replace the blower motor control module.
20. If all circuits test normal, replace the blower motor.

Component Testing

FRT HVAC BLWR Relay

1. Ignition OFF, disconnect the FRT HVAC BLWR relay.
2. Test for 60-180 ohms of resistance between terminals 85 and 86.
    - If the resistance is not within the specified range, replace the relay.
3. Test for infinite resistance between the following terminals:
    - 30 and 86
    - 30 and 87
    - 30 and 85
    - 85 and 87
    - If not the specified value, replace the relay.
4. Test for less than 2 ohms of resistance between terminals 30 and 87A.
    - If greater than the specified range, replace the relay.
5. Install a 40-amp fused jumper wire between relay terminal 85 and 12 volts. Install a jumper wire between relay terminal 86 and ground. Test for less than 2 ohms of resistance between terminals 30 and 87.

- If greater than the specified range, replace the relay.

Blower Motor

1. Ignition OFF, disconnect the harness at the blower motor.
2. Install a 40-amp fused jumper wire between circuit terminal 1 and 12 volts. Install a jumper wire between the low reference circuit terminal 2 and ground. Verify the blower motor activates
   - If the blower motor does not activate, replace the blower motor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Blower Motor Replacement**
- **Control Module References** for blower motor control module and HVAC control module replacement, setup and programming

TOO HOT IN VEHICLE

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This test resets the HVAC control module and checks for current air temperature actuator DTC.

7: Ambient air temperature must be above 3°C (38°F) in order for this A/C Compressor test to be run.

Too Hot in Vehicle

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The temperature cannot be adjusted or cooling is insufficient during the A/C operation.				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF.			

2	3. With a scan tool, observe the current DTC list for the HVAC Module. Does the scan tool display DTC B0408, B0409, B0419 or B0423?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	Go to **Step 3**
3	Place the blower motor switch in each speed position. Does the blower motor operate in any speed position?	-	Go to **Step 4**	Go to **Blower Motor Malfunction**
4	Does the blower motor operate in each speed position?	-	Go to **Step 5**	Go to **Blower Motor Malfunction**
5	1. Place the blower motor switch in the maximum speed position. 2. Place the mode controls in the BI-LEVEL position. 3. Alternately, place the recirculation switch in the outside air and recirculation positions. Does the recirculation door move from the recirculation position to the ambient air position?	-	Go to **Step 6**	Go to **Air Delivery Improper**
6	Place the passenger temperature in the OFF position. Does the Too Hot in Vehicle concern occur when A/C cooling desired?	-	Go to **Step 7**	Go to **Step 9**
	IMPORTANT: **Ambient air temperature must be above 3°C (38°F).** 1. Cover the sunload sensor. 2. Start the engine. 3. Open all panel outlets in order to allow maximum			

7	air flow. 4. Place the air temperature switch to the coldest position. 5. Place the mode switch in the VENT position. 6. Place the blower motor switch in the maximum speed position. 7. Ensure that the vent indicator is not illuminated. Does the A/C compressor operate?	-	Go to **Step 8**	Go to **HVAC Compressor Clutch Does Not Engage**
8	Perform the A/C system performance test. Refer to **Air Conditioning (A/C) System Performance Test (3.8L L26)** or **Air Conditioning (A/C) System Performance Test (4.6L LD8)** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 9**
9	Inspect the upper left, upper right, lower left and lower right air temperature sensors for the following conditions: • An obstruction to the airflow • A damaged or a missing seal to the sensor • Misaligned air ducts • A misaligned sensor Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 10**
	1. Turn ON the ignition, with the engine OFF. 2. Inspect for airflow through			

10	the inside air temperature assembly by placing a 5 cm (2 in) square piece of paper over the sensor air inlet. Does the paper stay in place?	-	Go to **Step 11**	Go to **Step 14**
11	1. Install a thermometer near the upper left, upper right, lower left and lower right air sensors and the inside air temperature assembly. 2. With a scan tool, observe the Inside Air Temp. data parameter in the Instrument Panel Module Data list. Does the scan tool indicate that the sensor temperatures are within the specifications at the thermometer temperatures?	-3 to +3°C (-5 to +5° F)	Go to **Step 12**	Go to **Step 17**
12	1. Turn the engine OFF. 2. Install a scan tool. 3. Cover the sunload sensor. 4. Start the engine. 5. Place the driver side temperature at 22°C (72° F). 6. With a scan tool, observe the Solar Sensor data parameter in the Instrument Panel Module data list. Does the scan tool indicate that the solar sensor parameter is greater than the specified value?	224 Counts	Go to **Step 13**	Go to **Step 19**
13	1. Uncover the sunload sensor. 2. Direct a light source at the sunload sensor. Do the counts change?	-	System OK	Go to **Step 19**

14	1. Disconnect inside air temperature assembly. 2. Turn ON the ignition, with the engine OFF. 3. Connect a test lamp between the ignition 3 circuit of the inside air temperature assembly and the inside air temperature assembly control circuit of the inside air temperature assembly. Does the test lamp illuminate?	-	Go to **Step 18**	Go to **Step 15**
15	Test the ignition 3 voltage circuit of the inside air temperature assembly for a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 16**
16	Test the inside air temperature assembly control circuit of the inside air temperature assembly for the following conditions: • A short to voltage • A high resistance • An open Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 20**
17	Test the suspect temperature sensor resistance. Does the resistance measure near the Sensor Resistance Table?	-	Go to **Step 21**	Go to **Step 18**
	Inspect for poor connections at			

18	the harness connector of the air temperature sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 22**
19	Inspect for poor connections at the harness connector of the sunload sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 23**
20	Inspect for poor connections at the harness connector of the HVAC module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 24**
21	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 25**
22	Replace the temperature sensor. Refer to **Inside Air Temperature Sensor Replacement**. Did you complete the replacement?	-	Go to **Step 26**	-
	Replace the sunload sensor. Refer to **Sun Load Sensor**			

Step	Action	Values	Yes	No
23	Did you complete the replacement?	-	Go to **Step 26**	-
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The temperature cannot be adjusted or cooling is insufficient during the A/C operation.				
24	Refer to **Control Module References** for replacement, setup and programming. Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 26**	Go to **Diagnostic System Check - Vehicle**
1	Did you complete the replacement?	-	Go to **Step 2**	-
25 **2**	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup and programming. 1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the current DTC list for the HVAC Module. Did you complete the replacement?	-	Go to **Step 26**	-
26	Operate the system in order to verify the repair. Does the scan tool display DTC B0408, B0409, B0419 or B0423? Did you correct the condition?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle** System OK	Go to **Step 3**

TOO COLD IN VEHICLE

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This test resets the HVAC control module and checks for current air temperature actuator DTC.

8: This checks for proper operation of coolant system to ensure heater output.

Too Cold in Vehicle

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The temperature cannot be adjusted or the heating is insufficient.				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
	1. Install a scan tool. 2. Turn ON the ignition, with			

2	the engine OFF. 3. With a scan tool, observe the current DTC list for the HVAC Module. Does the scan tool display DTC B0408, B0409, B0419 or B0423?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	Go to **Step 3**
3	Place the blower motor switch in each speed position. Does the blower motor operate in any speed position?	-	Go to **Step 4**	Go to **Blower Motor Malfunction**
4	Does the blower motor operate at the desired speeds?	-	Go to **Step 5**	Go to **Blower Motor Malfunction**
5	1. Place the blower motor switch in the maximum speed position. 2. Place the mode controls in the BI-LEVEL position. 3. Alternately, place the recirculation switch in the outside air and recirculation positions. Does the recirculation door move from the recirculation position to the ambient air position?	-	Go to **Step 6**	Go to **Air Delivery Improper**
6	Place the passenger temperature switch in the OFF position. Does the Too Cold in Vehicle concern occur when heating or defrosting is desired?	-	Go to **Step 7**	Go to **Step 9**
7	1. Start the engine. 2. Place the HVAC control module in the OFF position. Does the A/C compressor operate?	-	Go to **HVAC Compressor Clutch Does Not Disengage**	Go to **Step 8**
	Inspect the cooling system for the following conditions:			

8	• A low coolant level • A loose or worn accessory drive belt • A leaking radiator hose or heater hose • A kinked radiator hose or heater hose • A missing radiator cap pressure seal • A leaking radiator cap Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 9**
9	Inspect the upper left, upper right, lower left and lower right air temperature sensors for the following conditions: • An obstruction to the airflow • A damaged or a missing seal in the sensor • Misaligned air ducts • A misaligned sensor Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 10**
10	1. Turn ON the ignition, with the engine OFF. 2. Inspect for airflow through the inside air temperature assembly by placing a 5 cm (2 in) square piece of paper over the sensor air inlet. Does the paper stay in place?	-	Go to **Step 11**	Go to **Step 14**
	1. Install a thermometer near the upper left, upper right,			

11	lower left and lower right air sensors and the inside air temperature assembly. 2. With a scan tool, observe the Inside Air Temp. data parameter in the Instrument Panel Module data list: Does the scan tool indicate that the sensor temperatures are within the specification at the thermometer temperatures?	-3 to +3°C (-5 to +5° F)	Go to **Step 12**	Go to **Step 17**
12	1. Turn the engine OFF. 2. Install a scan tool. 3. Cover the sunload sensor. 4. Start the engine. 5. Place the driver side temperature to 22°C (72°F). 6. With a scan tool, observe the Solar Sensor data parameter in the HVAC Automatic data list. Does the scan tool indicate that the solar sensor parameter is greater than the specified value?	224 Counts	Go to **Step 13**	Go to **Step 19**
13	1. Uncover the sunload sensor. 2. Direct a light source at the sunload sensor. Do the counts change?	-	System OK	Go to **Step 19**
14	1. Disconnect the inside air temperature assembly. 2. Turn ON the ignition, with the engine OFF. 3. Connect a test lamp between the ignition 3 circuit of the inside air temperature assembly and the inside air temperature assembly	-		

	control circuit of the inside air temperature assembly. Does the test lamp illuminate?		Go to **Step 18**	Go to **Step 15**
15	Test the ignition 3 voltage circuit of the inside air temperature assembly for a high resistance or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 16**
16	Test the inside air temperature assembly control circuit of the inside air temperature assembly for the following conditions: • A short to voltage • A high resistance • An open Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 20**
17	Test the suspect temperature sensor resistance. Does the resistance measure near the Sensor Resistance Table?	-	Go to **Step 21**	Go to **Step 18**
18	Inspect for poor connections at the harness connector of the air temperature sensor. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 22**
	Inspect for poor connections at the harness connector of the sunload sensor. Refer to **Testing**			

19	**for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 23**
20	Inspect for poor connections at the harness connector of the HVAC module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 24**
21	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	-	Go to **Step 26**	Go to **Step 25**
22	Replace the temperature sensor. Refer to **Inside Air Temperature Sensor Replacement**. Did you complete the replacement?	-	Go to **Step 26**	-
23	Replace the sunload sensor. Refer to **Sun Load Sensor Replacement**. Did you complete the replacement?	-	Go to **Step 26**	-
24	Replace the DIM. Refer to **Control Module References** for replacement, setup and programming. Did you complete the replacement?	-	Go to **Step 26**	-
	Replace the HVAC control module. Refer to **Control Module References** for			

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: The temperature cannot be adjusted or the heating is insufficient.				
25	Did you complete the replacement, setup and programming?	-	Go to **Step 26**	-
26	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Diagnostic System Che**

AIR DELIVERY IMPROPER

Diagnostic Aids

Inspect the air delivery system for the following conditions:

- A dirty HVAC air filter
- An obstruction to the airflow
- Air leaks
- Misaligned air ducts
- Broken or binding linkages or doors

Air Delivery Improper

Step	Action	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views**			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Turn ON the ignition, with the engine OFF. 2. Turn OFF the HVAC control module. Is the blower motor OFF?	Go to **Step 3**	Go to **Blower Motor Malfunction**
3	Place the blower motor switch in each speed position. Does the blower motor operate in any of the speed positions?	Go to **Step 4**	Go to **Blower Motor Malfunction**
4	Does the blower motor operate in each speed position?	Go to **Step 5**	Go to **Blower Motor Malfunction**

5	1. Place the blower motor switch in the maximum speed position. 2. Place the mode switch in the bi-level position. 3. Place the recirculation switch in the ON position. 4. Observe the drive shaft of the recirculation actuator. 5. Place the recirculation switch in the OFF position. Does the recirculation door move from the recirculation position to the outside air position?	Go to **Step 6**	Go to **Air Recirculation Malfunction**
6	1. Place the mode switch in the PANEL position. 2. Observe the drive shaft of the mode actuator. 3. Place the defrost switch in the ON position. Does the drive shaft of the mode actuator rotate?	Go to Diagnostic Aids	Go to **Step 7**
7	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 9**	Go to **Step 8**
8	Replace the HVAC control module. Refer to **Control Module References** for replacement, setup and programming. Did you complete the replacement?	Go to **Step 9**	-
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

AIR RECIRCULATION MALFUNCTION

Diagnostic Aids

- If the control A circuit of the recirculation actuator is shorted to ground, the following conditions will occur.
  - The recirculation actuator will operate properly when recirculation is requested.
  - The recirculation actuator will continually modulate between the outside air and recirculation positions when outside air is requested.
- If the control B circuit of the recirculation actuator is shorted to ground, the following conditions will occur.
  - The recirculation actuator will operate properly when outside air is requested.
  - The recirculation actuator will continually modulate between the outside air and recirculation positions when recirculation is requested.
- Inspect the recirculation door and the recirculation actuator for the following conditions:
  - A misaligned recirculation actuator-Refer to **Recirculation Actuator Replacement**.
  - Broken or binding linkages
  - A broken or binding recirculation door
  - An obstruction that prevents the recirculation door from operating within its full range of motion
  - Missing seals to the recirculation door
  - Misaligned seals to the recirculation door

Air Recirculation Malfunction

Step	Action	Yes	No
Schematic Reference: HVAC Schematics **Connector End View Reference: HVAC Connector End Views** DEFINITION: Air recirculation is inoperative or is always ON.			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	1. Turn ON the ignition, with the engine OFF. 2. Place the blower motor switch in the maximum speed position. 3. Place the mode switch in the bi-level position. 4. Place the recirculation switch in the outside air position. 5. Place the recirculation switch in		

	the recirculation position. Do you hear an audible difference in the airflow when the recirculation switch is placed in the recirculation position?	Go to Diagnostic Aids	Go to **Step 3**
3	1. Place the recirculation switch in the outside air position. 2. Observe the drive shaft of the recirculation actuator. 3. Place the recirculation switch in the recirculation position. Does the drive shaft of the recirculation actuator rotate?	Go to Diagnostic Aids	Go to **Step 4**
4	1. Observe the drive shaft of the recirculation actuator. 2. With a scan tool, command the recirculation actuator to the recirculation position and to the outside air position. Does the drive shaft of the recirculation actuator rotate?	Go to **Step 12**	Go to **Step 5**
5	1. Turn OFF the ignition. 2. Disconnect the recirculation actuator. 3. Turn ON the ignition, with the engine OFF. 4. Probe the ignition 3 voltage circuit of the recirculation actuator with a test lamp that is connected to a good ground. Does the test lamp illuminate?	Go to **Step 6**	Go to **Step 13**
6	1. Connect a test lamp between the ignition 3 voltage circuit and the door control A circuit of the recirculation actuator. 2. With a scan tool, command the recirculation actuator to the		

	recirculation position and to the outside air position. Does the test lamp illuminate with either command?	Go to **Step 7**	Go to **Step 8**
7	1. Connect a test lamp between the ignition 3 voltage circuit and the door control B circuit of the recirculation actuator. 2. With a scan tool, command the recirculation actuator to the recirculation position and to the outside air position. Does the test lamp illuminate with either command?	Go to **Step 10**	Go to **Step 9**
8	Test the control A circuit of the recirculation actuator for the following: • An open • A high resistance • A short to ground • A short to voltage Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 16**	Go to **Step 12**
9	Test the control B circuit of the recirculation actuator for the following: • An open • A high resistance • A short to ground • A short to voltage Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 16**	Go to **Step 12**
	Inspect the recirculation door and the		

10	recirculation actuator for the following conditions: • A misaligned recirculation actuator-Refer to **Recirculation Actuator Replacement**. • Broken or binding linkages • A broken or binding recirculation door • An obstruction that prevents the recirculation door from operating within its full range of motion • Missing seals to the recirculation door • Misaligned seals to the recirculation door Did you find and correct the condition?	Go to **Step 16**	Go to **Step 11**
11	Inspect for poor connections at the harness connector of the recirculation actuator. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 16**	Go to **Step 14**
12	Inspect for poor connections at the harness connector of the HVAC control module. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 16**	Go to **Step 15**
13	Repair the ignition 3 voltage circuit of the recirculation actuator. Refer to **Wiring Repairs** . Did you complete the repair?	Go to **Step 16**	-
14	Replace the recirculation actuator. Refer to **Recirculation Actuator Replacement**. Did you complete the replacement?	Go to **Step 16**	-
	Replace the HVAC control module.		

15	Refer to **Control Module References** for replacement, setup and programming. Did you complete the replacement?	Go to **Step 16**	-
16	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

AFTERBLOW ENABLING

Afterblow is a feature that dries the evaporator core by operating the blower motor after the engine is turned off. This reduces the amount of microbial growth that can create undesirable odors. The vehicle does not come equipped with the afterblow feature turned on. If the afterblow feature is required due to an odor concern, it must be turned on by reprogramming the HVAC control module, refer to **Service Programming System (SPS)** in Programming and Setup.

After the HVAC control module has been programmed for afterblow, the following conditions must be met for afterblow to operate:

- The engine has been turned off for at least 32 minutes.
- The ambient air temperature is at least 21°C (70°F).
- The A/C compressor operated for more than 2 minutes.
- The system voltage is at least 12 volts.

Once the above conditions have been met, the following sequence of events will occur:

1. The blower motor will run for 20 seconds.
2. The blower motor will be off for 10 minutes.
3. The blower motor will run for and additional 20 seconds.

REPAIR INSTRUCTIONS

HVAC CONTROL MODULE REPLACEMENT

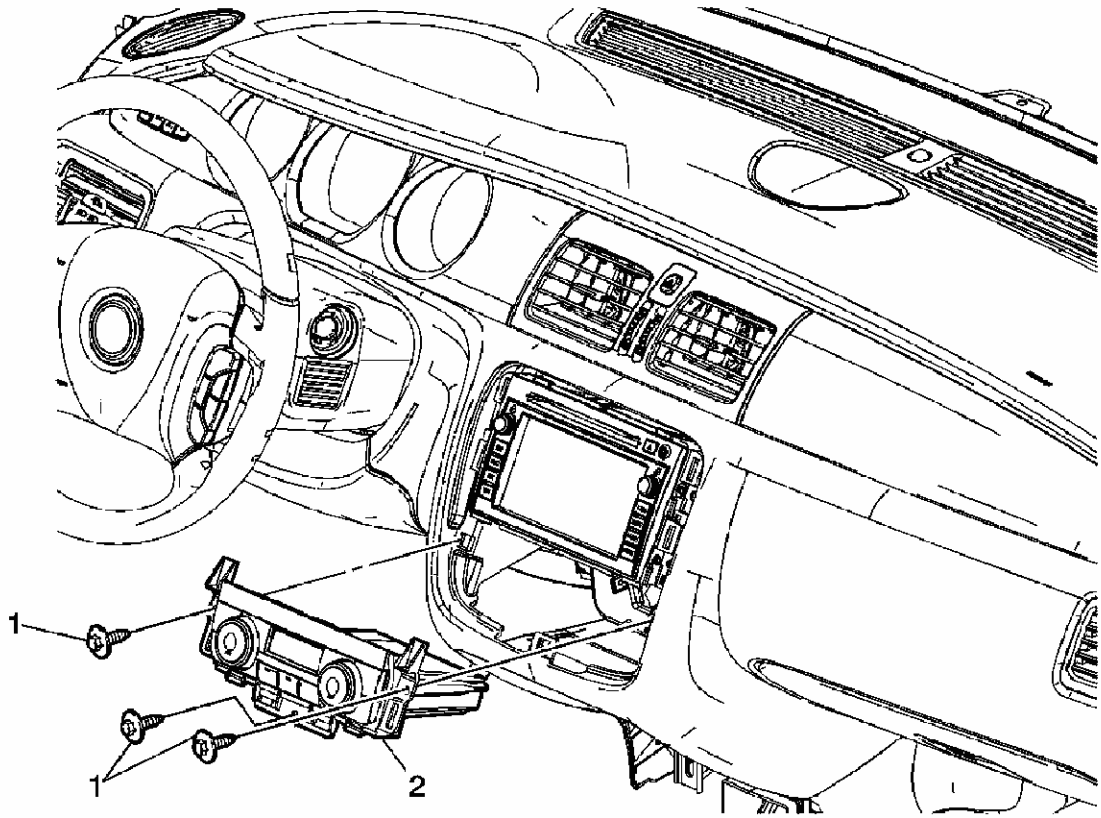


Fig. 23: View Of HVAC Control Module
Courtesy of GENERAL MOTORS CORP.

HVAC Control Module Replacement

Callout	Component Name
NOTE: Refer to Fastener Notice . **Fastener Tightening Specifications:** Refer to **Fastener Tightening Specifications** .**Preliminary Procedure:** Remove the instrument panel center trim panel. Refer to **Instrument Panel Center Trim Panel Replacement** .	
1	Heating and Air Conditioning Control Assembly Screw (Qty: 3) **Tighten:** 1.0 N.m (9 lb in)
2	Heating and Air Conditioning Control Assembly **Tip:** Disconnect the heating and air conditioning control assembly electrical connectors. Refer to **Control Module References** for programming and setup information.

RECIRCULATION ACTUATOR REPLACEMENT

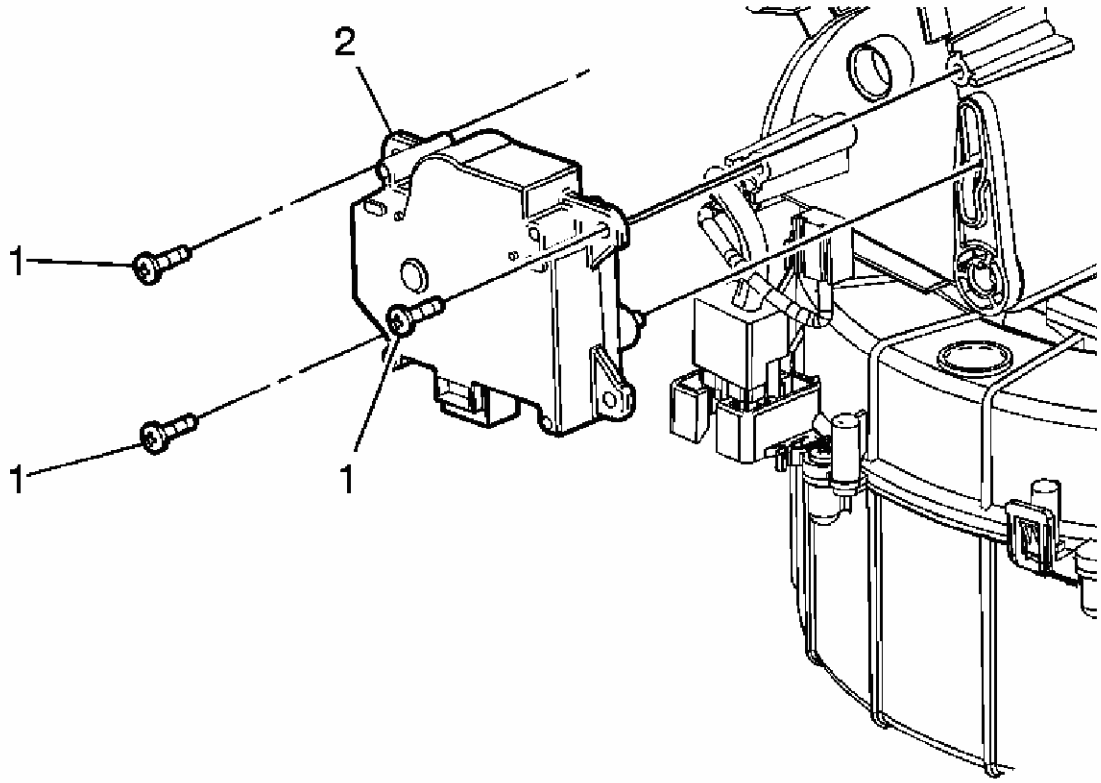


Fig. 24: Removing/Installing Recirculation Actuator
Courtesy of GENERAL MOTORS CORP.

Recirculation Actuator Replacement

Callout	Component Name
NOTE: Refer to Fastener Notice . **Fastener Tightening Specifications:** Refer to **Fastener Tightening Specifications** . **Preliminary Procedure** 1. Remove the HVAC Module. Refer to **HVAC Module Assembly Replacement** . 2. Disconnect the recirculation actuator electrical connector.	
1	Recirculation Actuator Screw (Qty: 3) **Tighten:** 1.0 N.m (9 lb in)
2	Recirculation Actuator

MODE ACTUATOR REPLACEMENT

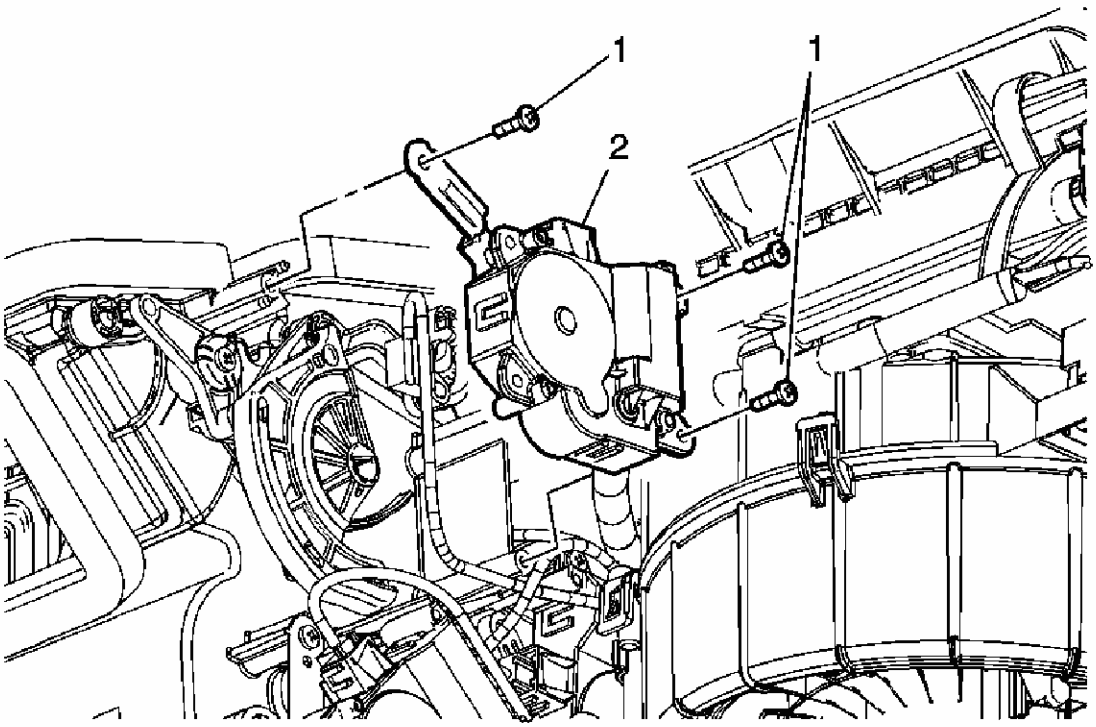


Fig. 25: Identifying Mode Actuator
Courtesy of GENERAL MOTORS CORP.

Mode Actuator Replacement

Callout	Component Name
NOTE: Refer to Fastener Notice . **Fastener Tightening Specifications:** Refer to **Fastener Tightening Specifications** . **Preliminary Procedure** 1. Remove the instrument panel lower trim panel. Refer to **Instrument Panel Lower Trim Panel Replacement** . 2. Remove the floor air outlet duct. Refer to **Floor Air Outlet Duct Replacement - Right Side** . 3. Disconnect the mode actuator electrical connector.	
1	Mode Actuator Screw (Qty: 3) **Tighten:** 1.0 N.m (9 lb in)
2	Mode Actuator

AIR TEMPERATURE ACTUATOR REPLACEMENT - RIGHT SIDE

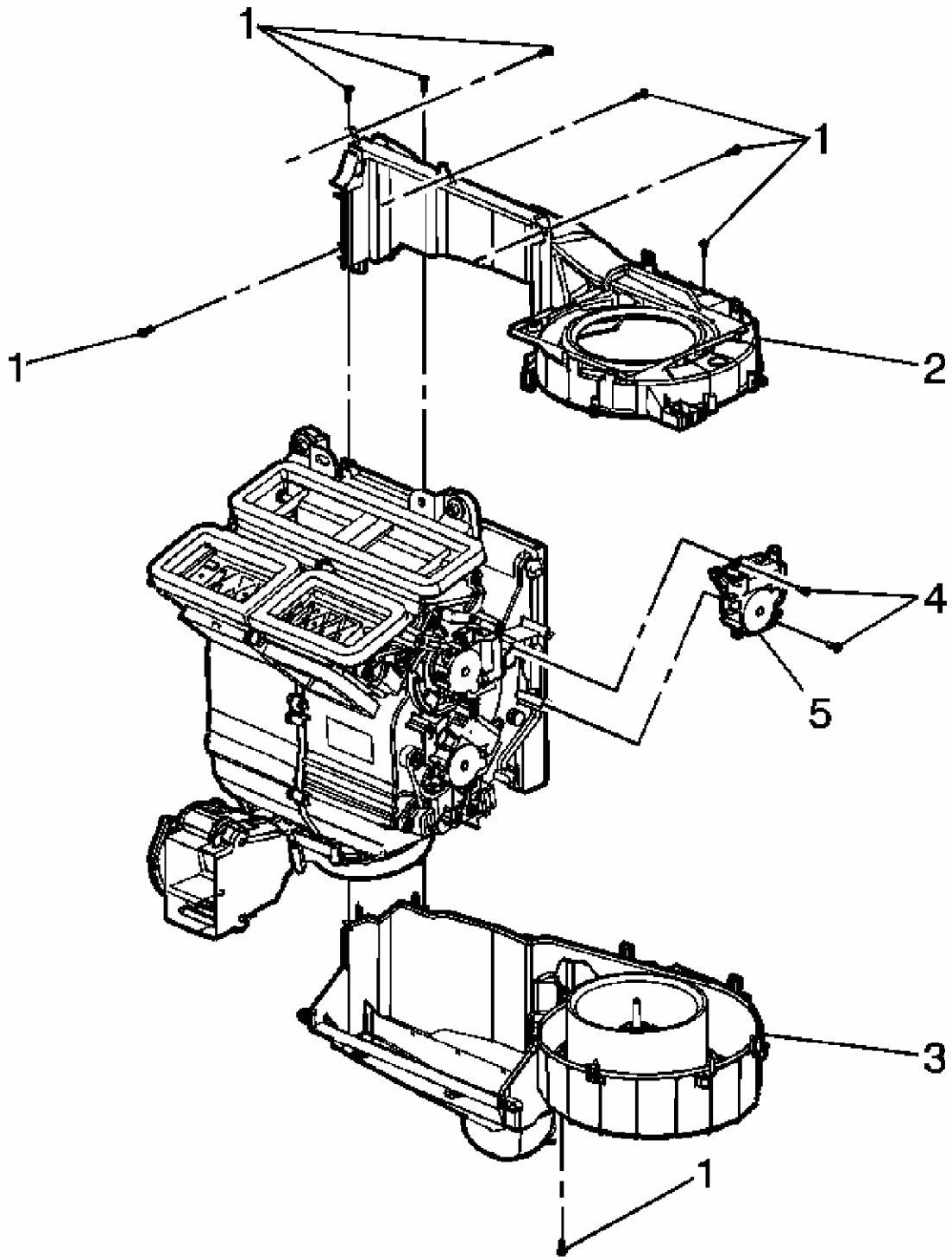


Fig. 26: Identifying Air Temperature Actuator - Right
Courtesy of GENERAL MOTORS CORP.

Air Temperature Actuator Replacement - Right Side

Callout	Component Name
Preliminary Procedure	

1. Remove the HVAC module assembly. Refer to **HVAC Module Assembly Replacement** .
2. Remove the right hand floor air outlet duct. Refer to **Floor Air Outlet Duct Replacement - Right Side** .
3. Remove the left hand floor air outlet duct. Refer to **Floor Air Outlet Duct Replacement - Left Side** .
4. Disconnect the HVAC module electrical connectors.

1	A/C Evaporator Case Upper Screw (Qty: 7) **NOTE:** **Refer to Fastener Notice .** **Tighten:** 1.0 N.m (9 lb in)
2	A/C Evaporator Case - Upper
3	A/C Evaporator Case - Lower
4	Air Temperature Actuator Screw (Qty: 2) **Tighten:** 1.0 N.m (9 lb in)
5	Air Temperature Actuator, Right

AIR TEMPERATURE ACTUATOR REPLACEMENT - LEFT SIDE

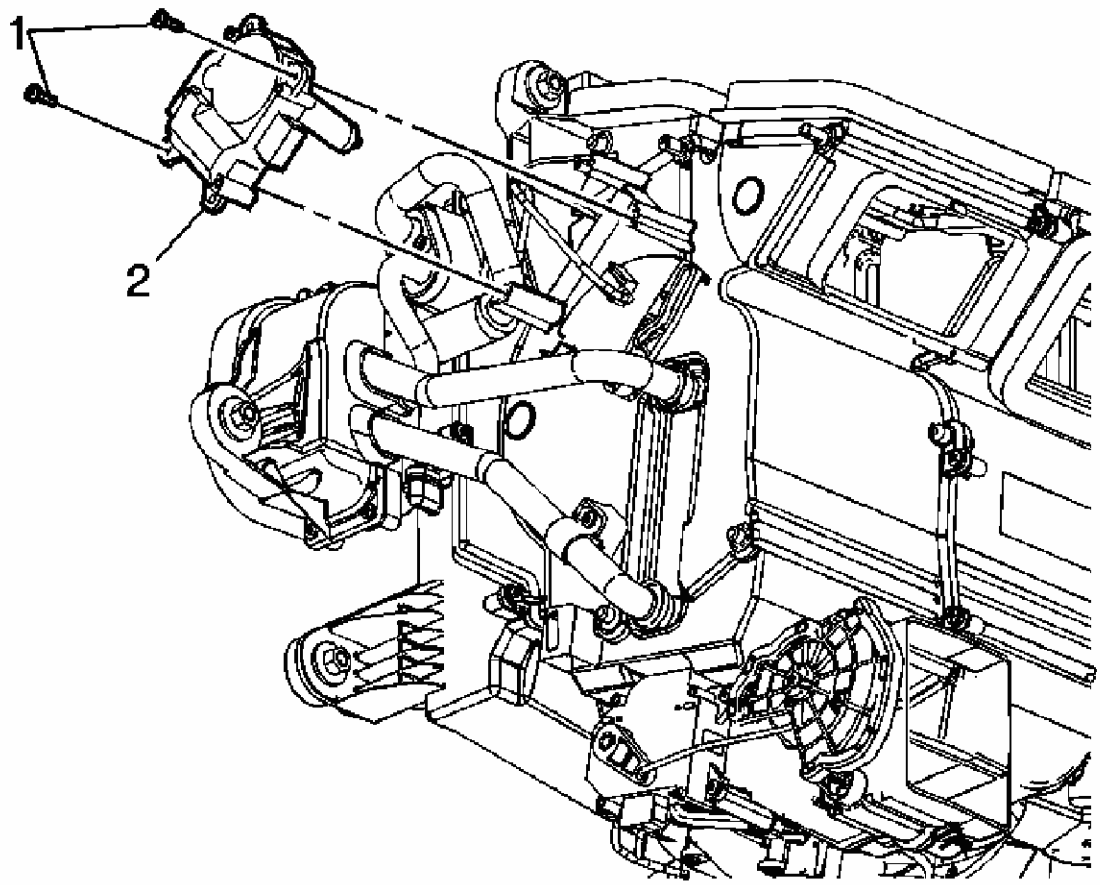


Fig. 27: Identifying Air Temperature Actuator - Left
Courtesy of GENERAL MOTORS CORP.

Air Temperature Actuator Replacement - Left Side

Callout	Component Name
Preliminary Procedure 1. Remove the instrument panel lower trim panel. Refer to **Instrument Panel Lower Trim Panel Replacement** . 2. Remove the left hand floor air outlet duct. Refer to **Floor Air Outlet Duct Replacement - Left Side** . 3. Disconnect the left hand air temperature actuator electrical connector.	
1	Mode Actuator Screw (Qty: 2) **NOTE:** Refer to Fastener Notice . **Tighten:** 1.0 N.m (9 lb in)
2	Mode Actuator

AMBIENT AIR TEMPERATURE SENSOR REPLACEMENT

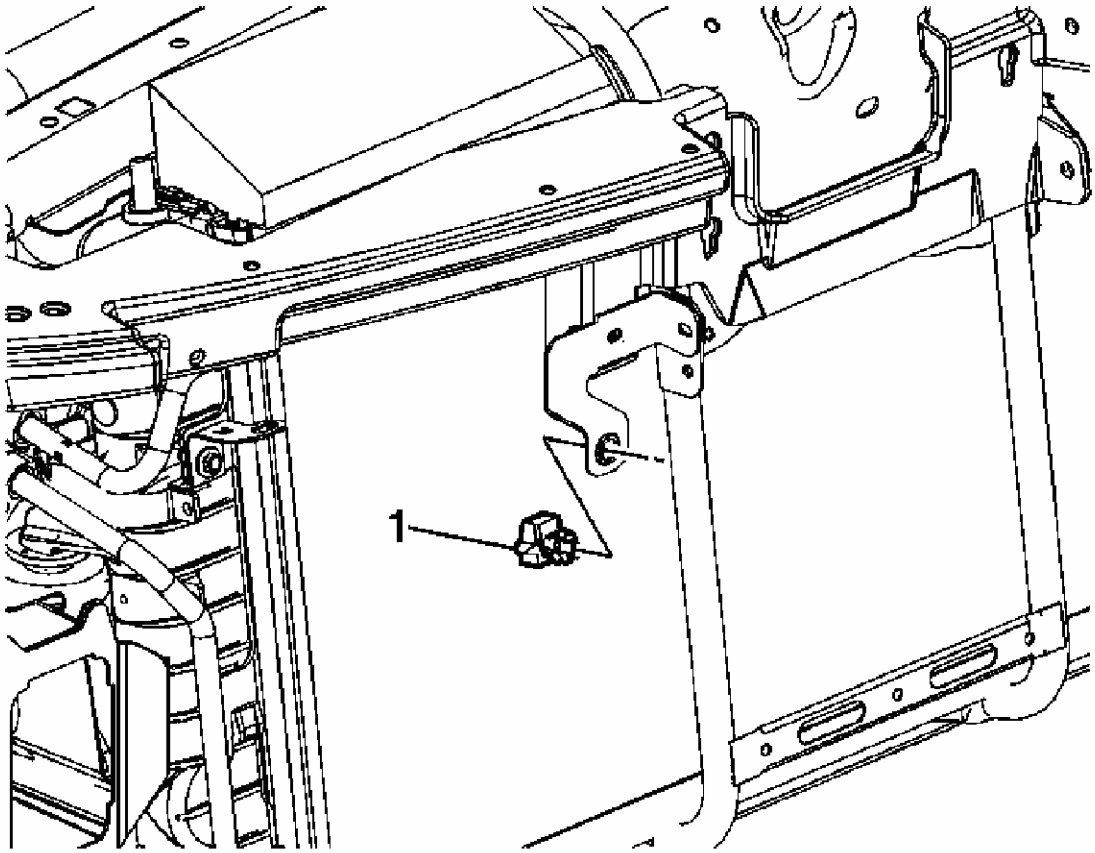


Fig. 28: Removing/Installing Ambient Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

Ambient Air Temperature Sensor Replacement

Callout	Component Name
Fastener Tightening Specifications: Refer to **Fastener Tightening Specifications**. **Preliminary Procedure** 1. Remove the front compartment sight shield. Refer to **Front Compartment Sight Shields Replacement** . 2. Disconnect the ambient air temperature sensor electrical connector.	
1	Ambient Air Temperature Sensor **Tip:** Squeeze the 3 ambient air temperature sensor tabs to release the sensor from the bracket.

INSIDE AIR TEMPERATURE SENSOR REPLACEMENT

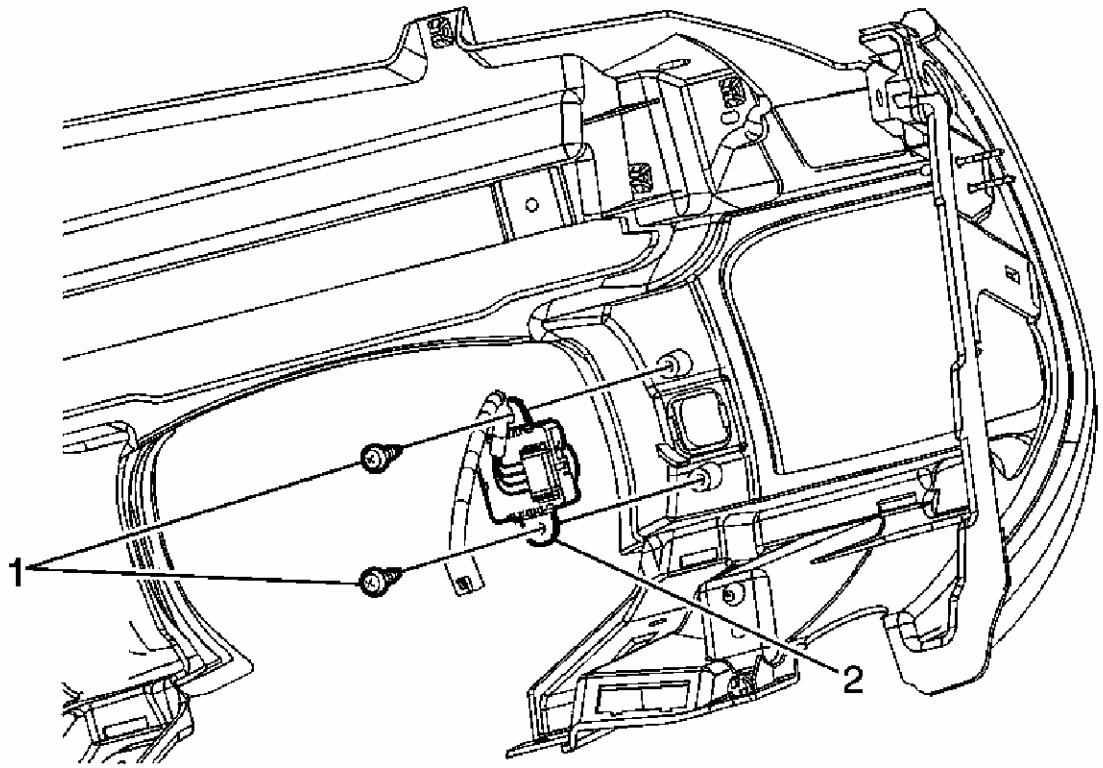


Fig. 29: Removing/Installing Inside Air Temperature Sensor Assembly
Courtesy of GENERAL MOTORS CORP.

Inside Air Temperature Sensor Replacement

Callout	Component Name
NOTE: Refer to Fastener Notice . **Fastener Tightening Specifications:** Refer to **Fastener Tightening Specifications** . **Preliminary Procedure** 1. Remove the instrument panel lower trim pad. Refer to **Instrument Panel Lower Trim Panel Replacement** . 2. Disconnect the inside air temperature sensor electrical connector.	
1	Inside Air Temperature Sensor Screw (Qty: 2) **Tighten:** 1.0 N.m (9 lb in)
2	Inside Air Temperature Sensor

SUN LOAD SENSOR REPLACEMENT

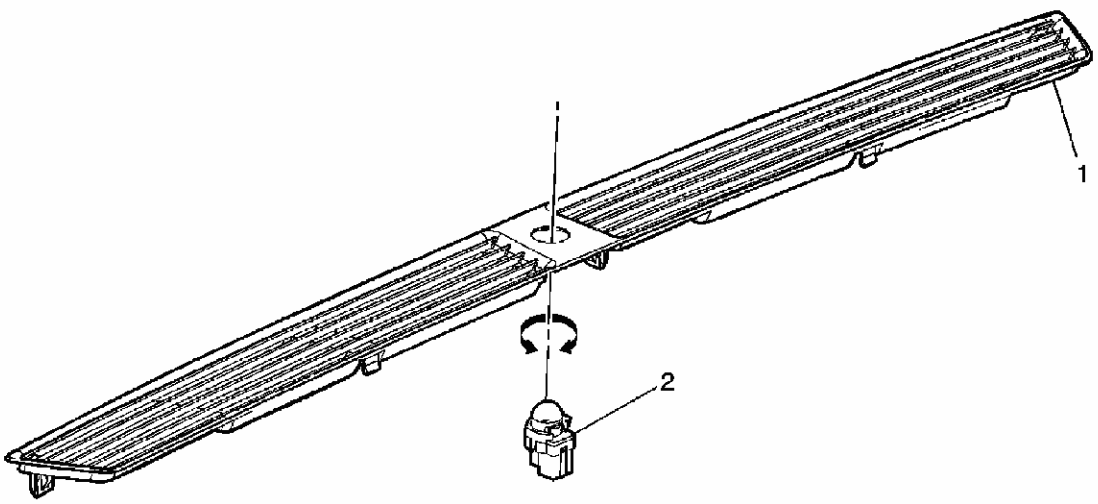


Fig. 30: Identifying Sun Load Sensor
Courtesy of GENERAL MOTORS CORP.

Sun Load Sensor Replacement

Callout	Component Name
Preliminary Procedure: Remove the instrument panel upper trim pad. Refer to **Instrument Panel Upper Trim Pad Replacement** .	
1	Windshield Defroster Grille Assembly
2	Headlamp Auto Control Ambient Light Sensor **Tip:** Twist and pull out of the defroster grille.

HEATER AND AIR CONDITIONING CONTROL WIRING HARNESS REPLACEMENT (W/EVAPORATOR TEMPERATURE SENSOR)

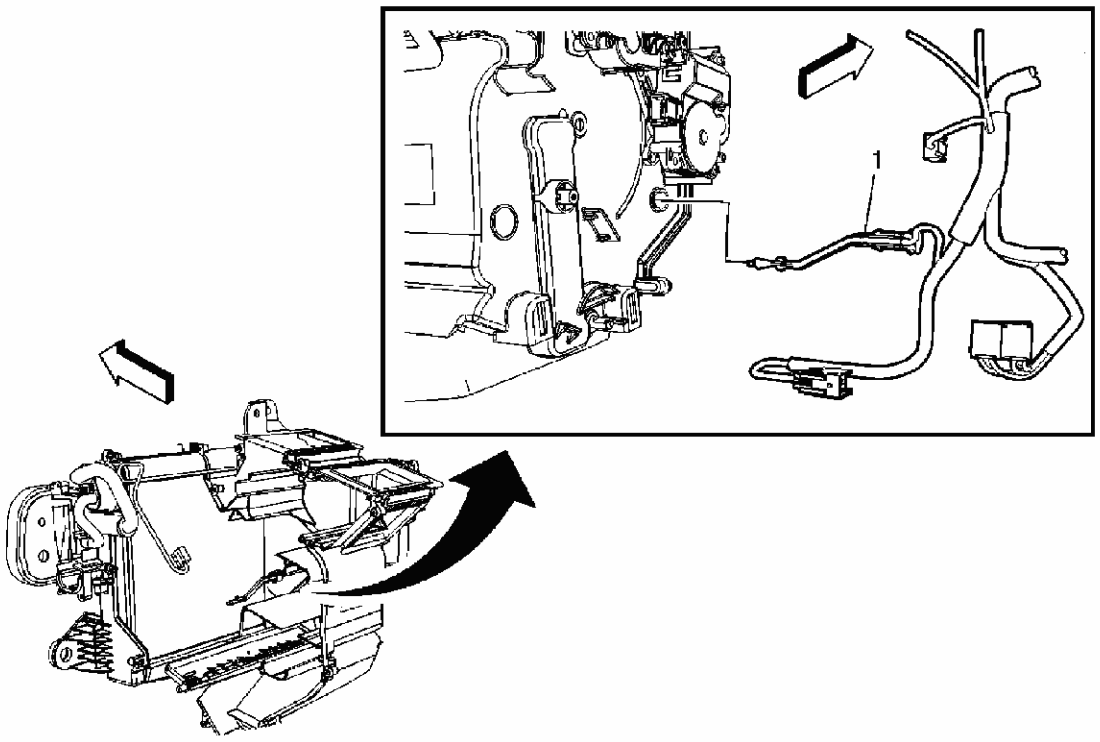


Fig. 31: Identifying Heater and Air Conditioning Control Wiring Harness Replacement (w/Evaporator Temperature Sensor)
Courtesy of GENERAL MOTORS CORP.

Heater and Air Conditioning Control Wiring Harness Replacement (w/Evaporator Temperature Sensor)

Callout	Component Name
Preliminary Procedure: Remove Evaporator Core. Refer to **Evaporator Core Replacement** .	
1	Heater and A/C Control Lamp Wiring Harness w/Evaporator Temperature Sensor. **Procedure:** Pinch the Evaporator Temperature Sensor locator tabs together from the inside of the HVAC case for sensor removal. **Tip:** The Evaporator Temperature Sensor is part of the Heater and A/C Control Lamp Wiring Harness and must be serviced as an assembly.

DESCRIPTION AND OPERATION

AIR DELIVERY DESCRIPTION AND OPERATION

The Air Delivery Description and Operation is divided into 5 primary areas:

- HVAC Control Components

- Air Speed
- Air Speed Auxiliary
- Air Distribution
- Recirculation
- Automatic Operation

HVAC Control Components

HVAC Control Module

The HVAC control module is a GMLAN device that interfaces between the operator and the HVAC system to maintain air temperature and distribution settings. The battery positive voltage circuit provides power that the control module uses for keep alive memory (KAM). The dash integration module (DIM), which is the vehicle power mode master, provides a device on signal. The control module supports the following features:

Air Delivery Description and Operation

Feature	Availability
Afterblow	Available if reprogrammed by the technician
Purge	Yes
Personalization	Yes
Actuator Calibration	No
Heated Seat Control	Optional

The HVAC control module will receive information that defines the current driver of the vehicle from the driver door module (DDM) through class 2 communication. The HVAC system will memorize the following system configurations for up to 2 unique drivers:

- Driver set temperature
- Passenger set temperature
- Mode
- Blower motor speed
- A/C compressor request, auto ON or A/C OFF

This information shall be stored inside the HVAC control module memory. When a different driver identification button is selected, the HVAC control module will recall the appropriate driver settings. When the HVAC control module is first turned on, the last stored settings for the current driver will be activated except for the rear defrost and heated seat settings.

Mode Actuator

The mode actuator is a 5-wire bi-directional electric motor that incorporates a feedback potentiometer. Low reference, 5-volt reference, position signal and 2 control circuits enable the actuator to operate. The control circuits use either a 0 or 12-volt value to coordinate the actuator movement. When the actuator is at rest, both control circuits have a value of 0 volts. In order to move the actuator, the HVAC control module grounds one of the control circuits while providing the other with 12 volts. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction. When the actuator shaft rotates, the potentiometers adjustable contact changes the door position signal between 0-5 volts. The HVAC control module uses a range of 0-255 counts to index the actuator position. The door position signal voltage is converted to a 0-255 count range. When the module sets a commanded or targeted value, one of the control circuits is grounded. As the actuator shaft rotates, the changing position signal is sent to the module. Once the position signal and the commanded value are the same, the module removes power and ground from the control circuits.

Recirculation Actuator

The recirculation actuators are 5-wire bi-directional electric motors that incorporate a feedback potentiometer. Ignition 3 voltage, low reference, control, 5-volt reference and position signal circuits enable the actuators to operate. The control circuit uses either a 0, 2.5 or 5-volt signal to command the actuator movement. When the actuator is at rest, the control circuit value is 2.5 volts. A 0 or 5-volt control signal commands the actuator movement in opposite directions. When the actuator shaft rotates, the potentiometer's adjustable contact changes the door position signal between 0-5 volts.

Blower Motor Relay

The blower motor relay provides a supply voltage to the blower motor and blower motor control processor. The HVAC control module commands the blower motor relay ON anytime the commanded blower speed is not OFF.

Blower Motor Control Processor

The blower motor control processor is an interface between the HVAC control module and the blower motor. The blower motor speed control, blower motor supply voltage and ground circuits enable the control processor to operate. The HVAC control module provides a pulse width modulation (PWM) signal to the control processor in order to command the blower motor speed. The control processor uses the blower motor ground as a low side control to adjust the blower motor speed.

Air Speed

The blower motor forces air to circulate within the vehicles interior. The vehicle operator determines the blower motors speed by placing the blower motor switch in a desired speed position or by selecting automatic operation. In manual operation, once a blower speed is

selected, the blower speed remains constant, until a new speed is selected. In automatic operation, the HVAC control module will determine what blower speed is necessary in order to achieve or maintain a desired temperature.

As the requested blower speed increases, the following conditions occur:

- The HVAC control module increases the amount of time that the blower motor speed control circuit is modulated to ground.
- The voltage and duty cycle, measured between the blower motor speed control circuit and ground, decrease.

As the requested blower speed decreases, the following conditions occur:

- The HVAC control module decreases the amount of time that the blower motor speed control circuit is modulated to ground.
- The voltage and duty cycle, measured between the blower motor speed control circuit and ground, increase.

Afterblow

Afterblow is a feature that dries the evaporator core by operating the blower motor after the engine is turned OFF. This reduces the amount of microbial growth that can create undesirable odors. The vehicle does not come equipped with the afterblow feature turned ON. If the afterblow feature is required due to an odor concern, it must be turned ON by reprogramming the HVAC control module. Refer to **Service Programming System (SPS)** .

After the HVAC control module has been programmed for afterblow, the following conditions must be met for afterblow to operate:

- The engine has been turned OFF for at least 30 minutes.
- The ambient air temperature is at least 21°C (70°F).
- The A/C compressor operated for more than 2 minutes before shut down.
- The system voltage is at least 12 volts.

Once the above conditions have been met, the following sequence of events will occur:

1. The blower motor will RUN for 20 seconds.
2. The blower motor will be OFF for 10 minutes.
3. The blower motor will RUN for and additional 20 seconds.

Steering Wheel Controls

The HVAC control module receives class 2 messages from the radio interface that the driver

has activated a steering wheel control switch. The steering wheel control buttons control several different functions including the following HVAC functions:

- Fan speed increase
- Fan speed decrease
- Driver set temperature increase
- Driver set temperature decrease

In order to configure the steering wheel controls, refer to **Radio/Audio System Description and Operation** .

Air Distribution

The HVAC control module controls the mode actuator in order to distribute airflow to a desired outlet. The mode switch provides the vehicle operator with the ability to override the automatic setting. When the mode door is moved to the defrost position, the A/C compressor clutch engages and the recirculation actuator will be moved to the outside air position. In the outside air position, the incoming air is filtered by the passenger compartment air filter.

IMPORTANT: The HVAC system allows air to the outboard panel outlets in all air distribution modes. This allows air to be circulated higher in the cabin under any operating condition. The panel outlets have three operating positions, open, side window defogger and closed. To eliminate air from these outlets, the individual outlet thumbwheel must be turned to the OFF or side window defogger position.

Recirculation

The HVAC control module controls the air intake through the recirculation actuator. Recirculation is not available when the mode is in defrost. When the mode is in defog, recirculation will only be available for 10 minutes. In the outside air position, the incoming air is filtered by the passenger compartment air filter.

Automatic Operation

In automatic operation, the HVAC control module will maintain the comfort level inside of the vehicle by controlling the A/C compressor clutch, the blower motor, the air temperature actuators, mode actuator and recirculation.

To place the HVAC system in full automatic operation, the AUTO selection must be activated.

Once the desired temperature is reached, the blower motor, mode, recirculation and temperature actuators will automatically adjust to maintain the temperature selected. The

HVAC control module performs the following functions to maintain the desired air temperature:

- Regulate blower motor speed
- Position the air temperature actuator
- Position the mode actuator
- Position the recirculation actuator
- Request A/C operation

When the warmest position is selected in automatic operation the blower speed will increase gradually until the vehicle reaches normal operating temperature. When normal operating temperature is reached the blower will stay on high speed and the air temperature actuators will stay in the full heat position. The mode actuator will remain in the floor position.

When the coldest position is selected in automatic operation the blower will stay on high and the air temperature actuators will stay in the full cold position. The mode actuator will remain in the panel position and the recirculation actuator will remain in the recirculation position.

In cold temperatures, the automatic HVAC system will provide heat in the most efficient manner. The vehicle operator can select an extreme temperature setting, but the system will not warm the vehicle any faster. In warm temperatures, the automatic HVAC system will also provide air conditioning in the most efficient manner. Selecting an extreme cool temperature will not cool the vehicle any faster.

AIR TEMPERATURE DESCRIPTION AND OPERATION

The air temperature controls are divided into 4 primary areas:

- Automatic Operation
- The Heating and Air Conditioning System
- The A/C Cycle
- Auxiliary heating and A/C system

HVAC Control Components

HVAC Control Module

The HVAC control module is a GMLAN device that interfaces between the operator and the HVAC system to maintain air temperature and distribution settings. The battery positive voltage circuit provides power that the HVAC control module uses. The control module supports the following features:

Air Temperature Description and Operation

Feature	Availability
Afterblow	Available if reprogrammed by the technician
Purge	Yes
Personalization	Yes
Actuator Calibration	No
Heated Seat Control	Optional

Remote Start and Personalization

If the remote start personalization feature for climate control is selected through the HVAC control module will receive information that defines the current driver of the vehicle from the RKE module through GMLAN communication. This information shall be stored inside the HVAC control module memory. When a different key fob is selected, the HVAC control module will recall the appropriate driver settings. When the HVAC control module is first turned ON, the last stored settings for the current driver will be activated. Upon a battery reset, the HVAC control module shall also set the driver ID to Driver#2. The HVAC system will memorize the following system configurations for up to 2 unique drivers:

- Driver set temperature
- Passenger set temperature
- Mode
- Blower motor speed
- A/C compressor request, auto ON or A/C OFF

OnStar(R) Blower Control ON/OFF

During OnStar(R) audio control ON, the HVAC control module receives signals from OnStar (R) to reduce blower level between M1 and M2. OnStar(R) blower control becomes active in auto or manual blower operation. This blower reduction is to ensure that all incoming and outgoing voice calls will be recognized by the OnStar(R) module. The driver is allowed to override the OnStar(R) auto blower level by increasing or decreasing it manually to any desired level. When OnStar(R) no longer sends the request for blower control the HVAC control module will cancel OnStar(R) blower control and resume previous blower level if no manual override of the blower was selected.

Air Temperature Actuators

The air temperature actuator is a 5-wire bi-directional electric motor that incorporates a feedback potentiometer. Low reference, 5-volt reference, position signal and 2 control circuits enable the actuator to operate. The driver air temperature actuator is a reverse polarity motor. The control circuits use either a 0 or 12-volt value to coordinate the actuator movement. When the actuator is at rest, both control circuits have a value of 0 volts. In order to move the

actuator, the HVAC control module grounds one of the control circuits while providing the other with 12 volts. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction. When the actuator shaft rotates, the potentiometers adjustable contact changes the door position signal between 0-5 volts. The HVAC control module uses a range of 0-255 counts to index the actuator position. The door position signal voltage is converted to a 0-255 count range. When the module sets a commanded or targeted value, one of the control circuits is grounded. As the actuator shaft rotates the changing position signal is sent to the module. Once the position signal and the commanded value are the same, the module removes power and ground from the control circuits.

Air Temperature Sensors

The air temperature sensors are 2-wire negative temperature co-efficient thermistors. The vehicle uses the following air temperature sensors:

- Ambient
- Inside

A signal and low reference circuit enables the sensor to operate. As the air temperature surrounding the sensor increases, the sensor resistance decreases. The sensor signal decreases as the resistance decreases. The sensor signal varies between 0-5 volts. The HVAC control module converts the signal to a range between 0-255 counts.

The inside temperature sensor operates within a temperature range between -6.5 to +57.5°C (+20.3 to +135.5°F). If the sensor is shorted to ground, voltage or an open, the system will operate using an estimated default value to allow the system to operate. The ambient sensor operates within a temperature range between -30 to +51°C (-22 to +123.8°F). If the HVAC control module has determined that the ambient temperature sensor has failed, the driver information center (DIC) display shall display (-°F) in place of the outside air temperature. If the sensor is shorted to ground, voltage or an open, the system will operate using an estimated default value to allow the system to operate. If the engine coolant temperature is not more than 3°C (5.4°F) above the sensor reading or if the engine has not been started in 3 hours, then the actual ambient air temperature sensor reading is displayed. Also at vehicle speeds greater than 16 km/h (10 mph), the ambient air temperature displayed may be allowed to increase, but only at a slow, filtered rate. The DIC displays the ambient air temperature value that it receives from the HVAC control module through a GMLAN message. The ambient air temperature value can be updated by an outside air instant update feature.

To use this feature, press the following switches on the HVAC control module simultaneously:

- LEFT TEMPERATURE UP
- PASS ENABLE
- REAR DEFOG ENABLE

Sunload Sensor

The sunload sensor is a 2-wire photo diode. The vehicle uses left and right sunload sensors. The 2 sensors are integrated into the sunload sensor assembly along with the ambient light sensor. Low reference and signal circuits enable the sensor to operate. As the sunload increases, the sensor signal decreases. The sensor operates within an intensity range between completely dark and bright. The sensor signal varies between 0-5 volts. The HVAC control module converts the signal to a range between 0-255 counts. The sunload sensor provides the HVAC control module a measurement of the amount of light shining on the vehicle. Bright or high intensity light causes the vehicle's inside temperature to increase. The HVAC system compensates for the increased temperature by diverting additional cool air into the vehicle. If the sensor is open or shorted, no sunload adjustment occurs and the SERVICE A/C SYSTEM message is displayed in the I/P cluster.

Evaporator Temperature Sensor

The HVAC control module monitors the temperature of the air passing through the evaporator by the A/C evaporator air temperature sensor. This sensor is located on the backside of the evaporator core. The temperature is used to cycle the A/C compressor ON and OFF to prevent the evaporator core from freezing. A thermistor inside the sensor varies its resistance to monitor the evaporator air temperature. The HVAC control module monitors the voltage drop across the thermistor when supplied with a 5-volt reference signal. The HVAC control module will send a GMLAN message to the engine control module (ECM) to stop requesting the A/C compressor clutch operation if the temperature drops below -4°C (257°F). The sensor must be above 2°C (36°F) to request the A/C compressor clutch again.

The sensor operates within a temperature range between -40 to +215°C (-40 to +355°F). If the HVAC control module detects an open in the evaporator temperature sensor or circuit, the GMLAN message sent to the ECM will not submit the A/C ON request. The HVAC control module will then send a request to the I/P for display of the SERVICE A/C SYSTEM that will be displayed on the DIC. The HVAC control module will also turn off the AC LED display on the ECC module as long as the condition is present, if the AC button is pushed the LED will flash 3 times and remain off.

A/C Refrigerant Pressure Sensor

The A/C refrigerant pressure sensor is a 3-wire piezoelectric pressure transducer. A 5-volt reference, low reference and signal circuits enable the sensor to operate. The A/C pressure signal can be between 0-5 volts. When the A/C refrigerant pressure is low, the signal value is near 0 volts. When the A/C refrigerant pressure is high, the signal value is near 5 volts.

The A/C refrigerant pressure sensor prevents the A/C system from operating when an excessively high or low pressure condition exists.

If the ECM detects a failure in the A/C refrigerant pressure sensor or circuit, the GMLAN

message sent to the HVAC control module will be invalid. The HVAC control module will then send a request to the I/P for display of the SERVICE A/C SYSTEM that will be displayed on the DIC. The HVAC control module will also turn off A/C OFF LED display on the module as long as the condition is present, if the AC button is pushed the LED will flash 3 times and remain off

Heating and A/C Operation

The purpose of the heating and A/C system is to provide the following:

- Heated air
- Cooled air
- Remove humidity from the interior of the vehicle
- Reduce windshield fogging

Regardless of the temperature setting, the following can effect the rate that the HVAC system can achieve a desired temperature:

- Recirculation actuator setting
- Difference between inside and desired temperature
- Difference between ambient and desired temperature
- Blower motor speed setting
- Mode setting

The HVAC control module commands or monitors the following actions when an air temperature setting is selected.

- Warmest Position-The air temperature actuator door position directs maximum air flow through the heater core.
- Coldest Position-The air temperature actuator door position directs maximum air flow around the evaporator core.
- Between the Warmest and Coldest Position-The following sensors are monitored to direct the appropriate amount of air through the heater core to achieve the desired temperature:
    - Sunload
    - Ambient temperature
    - Inside temperature

The A/C system is engaged by selecting the A/C button on the ECC control module. The A/C will illuminate LED when the A/C button is selected. The control module sends a GMLAN A/C request message to the engine control module (ECM) for A/C compressor clutch

operation. The following conditions must be met in order for the ECM to turn ON the compressor clutch:

- HVAC control module
  - Evaporator Temperature more than 4°C (39°F)
  - Control module operating range 9-16 volts
- ECM
  - Engine coolant temperature (ECT) is less than 125°C (257°F).
  - A/C pressure is between 3 137 kPa (455 psi) and 210 kPa (210 psi).

Once engaged, the compressor clutch will be disengaged for the following conditions:

- Throttle position is 90 percent.
- A/C pressure is more than 3 137 kPa (455 psi).
- A/C pressure is less than 193 kPa (28 psi).
- ECT is more than 125°C (257°F).
- Transmission shift
- ECM detects excessive torque load.
- ECM detects insufficient idle quality.
- ECM detects a hard launch condition.

When the compressor clutch disengages, the compressor clutch diode protects the electrical system from a voltage spike.

Rear Vent Operation

The rear two vents do not have dual zone functionality. Heat or A/C will come out of the vents depending on the temperature desired and the position of the mode switch. The temperature that comes out of the rear vents is controlled by the passenger temp actuator only. If dual zone is selected the passenger switch will be the only switch that can control the temperature of the rear air. If the HVAC system is in single zone operation the driver temp switch will adjust the temperature of the rear air because the passenger temp actuator is controlled by the driver temp switch in single zone. The air is delivered to the rear vents when in AUTO, VENT and VENT FLOOR positions only.

Automatic Operation

In automatic operation, the HVAC control module will maintain the comfort level inside of the vehicle by controlling the A/C compressor clutch, the blower motor, the air temperature actuators, mode actuator and recirculation actuator.

To place the HVAC system in automatic mode, the following is required:

- The blower motor switch must be in the AUTO position.
- The air temperature switch must be in any other position other than 60 or 90 degrees.
- The mode switch must be in the AUTO position.

Once the desired temperature is reached, the blower motor, mode, recirculation and temperature actuators will automatically adjust to maintain the temperature selected. The HVAC control module performs the following functions to maintain the desired air temperature:

- Regulate blower motor speed
- Position the air temperature actuator
- Position the mode actuator
- Position the recirculation actuator
- Request A/C operation

When the warmest position is selected in automatic operation, the blower speed will increase gradually, until the vehicle reaches normal operating temperature. When normal operating temperature is reached, the blower will stay on high speed and the air temperature actuators will stay in the full heat position. When the coldest position is selected in automatic operation, the blower will stay on high and the air temperature actuators will stay in the full cold position.

In cold temperatures, the automatic HVAC system will provide heat in the most efficient manner. The vehicle operator can select an extreme temperature setting, but the system will not warm the vehicle any faster. In warm temperatures, the automatic HVAC system will also provide air conditioning in the most efficient manner. Selecting an extremely cool temperature will not cool the vehicle any faster.

Auxiliary HVAC Control Module

The auxiliary HVAC control module is a non-GMLAN device the interfaces between the operator and the auxiliary HVAC system to maintain air temperature and air distribution settings. Five volts and ground are supplied to the rear HVAC control module. The front HVAC control module monitors the position of the rear air temperature actuator and the position of the rear air temperature control module. The front HVAC control module monitors the position of the rear air temperature actuator and the rear mode actuator. The front HVAC module will move the actuators to the proper position when it receives a request from the rear HVAC control module on which position to place the actuator.

Auxiliary Heating and A/C Operation

The auxiliary HVAC control module provides airflow direction and temperature control for the back seat passengers. Passengers can operate the rear HVAC control module in either

manual or automatic modes. Auxiliary HVAC temperatures can be set cooler or warmer than the front primary HVAC setting. The front HVAC module provides power and ground to the auxiliary air temperature actuator. The front HVAC module receives power through the ignition 1 and battery positive voltage circuits from the underhood fuse block. Each circuit provides both power and ground to the auxiliary air temperature actuator. When the auxiliary air temperature actuator is being held in position, both of the auxiliary air temperature door control circuits have 0 volts applied to both sides of the actuator motor. This holds the actuator stationary. When a cooler temperature is requested, one of the auxiliary air temperature door control circuits will ground, driving the auxiliary air temperature actuator to the desired temperature. When a warmer temperature is requested, the other auxiliary air temperature door control circuit will ground. This moves the auxiliary air temperature actuator into the desired position.

Auxiliary Air Temperature Actuator

The auxiliary air temperature actuator is a 5-wire bi-directional electric motor that incorporates a feedback potentiometer. Low reference, 5-volt reference, position signal and 2 control circuits enable the actuator to operate. The control circuits use either a 0 or 12-volt value to coordinate the actuator movement. When the actuator is at rest, both control circuits have a value of 0 volts. In order to move the actuator, the HVAC control module grounds one of the control circuits while providing the other with 12 volts. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction. When the actuator shaft rotates, the potentiometers adjustable contact changes the door position signal between 0-5 volts. The HVAC control module uses a range of 0-255 counts to index the actuator position. The door position signal voltage is converted to a 0-255 count range. When the module sets a commanded or targeted value, one of the control circuits is grounded. As the actuator shaft rotates, the changing position signal is sent to the module. Once the position signal and the commanded value are the same, the module removes power and ground from the control circuits.

A/C Cycle

Refrigerant is the key element in an air conditioning system. R-134a is presently the only EPA approved refrigerant for automotive use. R-134a is a very low temperature gas that can transfer the undesirable heat and moisture from the passenger compartment to the outside air.

The Denso 7SBU16 variable displacement swash plate A/C compressor is belt driven and operates when the magnetic clutch is engaged. The compressor builds pressure on the vapor refrigerant. Compressing the refrigerant also adds heat to the refrigerant. The refrigerant is discharged from the compressor, through the discharge hose and forced to flow to the condenser and then through the balance of the A/C system. The A/C system is mechanically protected with the use of a high pressure relief valve. If the high pressure switch were to fail or if the refrigerant system becomes restricted and refrigerant pressure continues to rise, the high pressure relief will pop open and release refrigerant from the system.

Compressed refrigerant enters the condenser in a high temperature, high pressure vapor state. As the refrigerant flows through the condenser, the heat of the refrigerant is transferred to the ambient air passing through the condenser. Cooling the refrigerant causes the refrigerant to condense and change from a vapor to a liquid state.

The condenser is located in front of the radiator for maximum heat transfer. The condenser is made of aluminum and aluminum cooling fins, which allow rapid heat transfer for the refrigerant. The semi-cooled liquid refrigerant exits the condenser and flows through the liquid line, to the thermal expansion valve.

The thermal expansion valve is located in the liquid line between the condenser and the evaporator. The thermal expansion valve is the dividing point for the high and the low pressure sides of the A/C system. As the refrigerant passes through the thermal expansion valve, the pressure of the refrigerant is lowered. Due to the pressure differential of the liquid refrigerant, the refrigerant will begin to vaporize at the thermal expansion valve. The thermal expansion valve also meters the amount of liquid refrigerant that can flow into the evaporator.

Refrigerant exiting the thermal expansion valve flows into the evaporator core in a low pressure, liquid state. Ambient air is drawn through the HVAC module and passes through the evaporator core. Warm and moist air will cause the liquid refrigerant boil inside of the evaporator core. The boiling refrigerant absorbs heat from the ambient air and draws moisture onto the evaporator. The refrigerant exits the evaporator back through the thermal expansion valve and into the suction line and back to the compressor, in a vapor state completing the A/C cycle of heat removal. At the compressor, the refrigerant is compressed again and the cycle of heat removal is repeated.

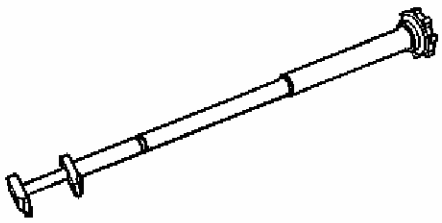
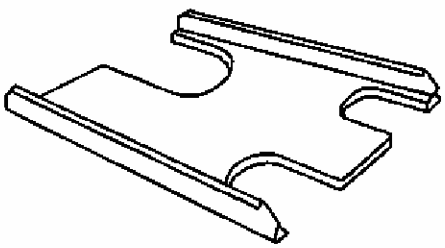
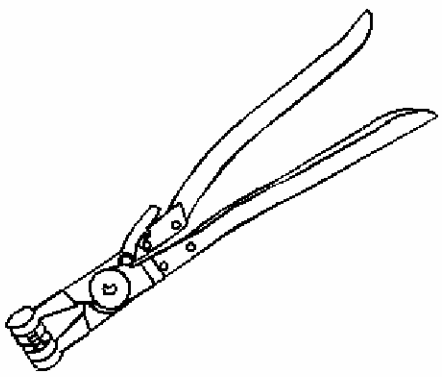
The conditioned air is distributed through the HVAC module for passenger comfort. The heat and moisture removed from the passenger compartment will also change form or condense and is discharged from the HVAC module as water under the vehicle.

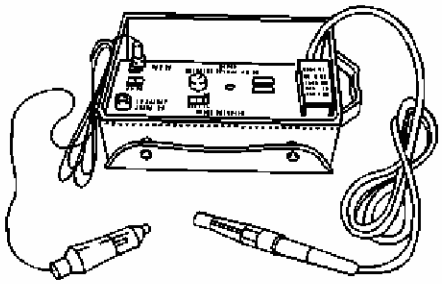
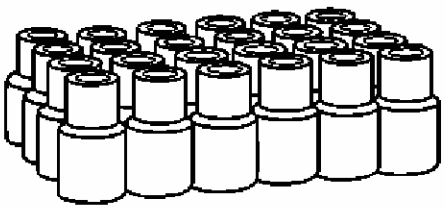
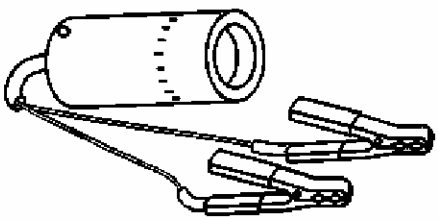
SPECIAL TOOLS AND EQUIPMENT

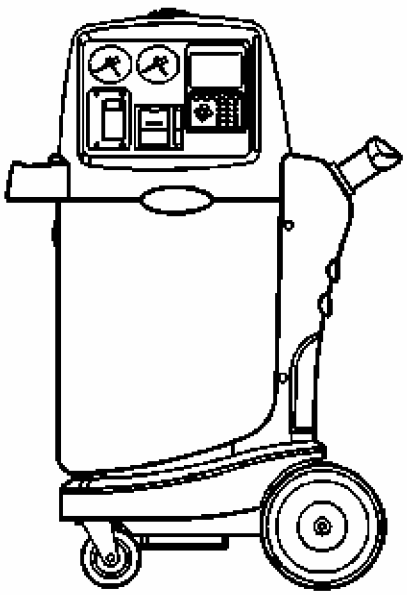
SPECIAL TOOLS

Special Tools

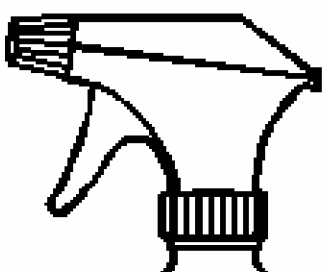
Illustration	Tool Number/Description
	J 37097-A Heater Close Clamp Tool

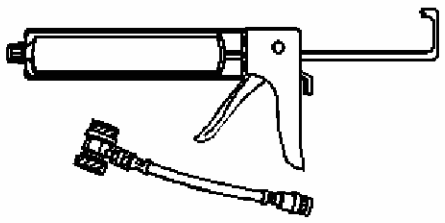
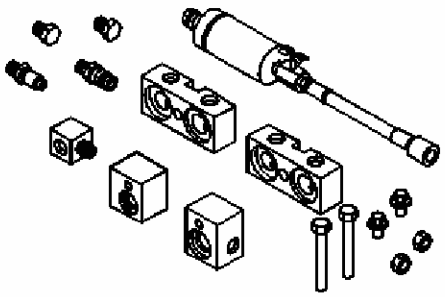
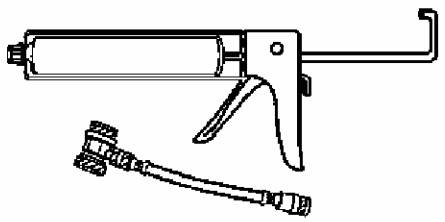
	
	J 38042 Dual O-Ring Tube Separator
	J 38185 Hose Clamp Pliers
	J 39400-A Halogen Leak Detector

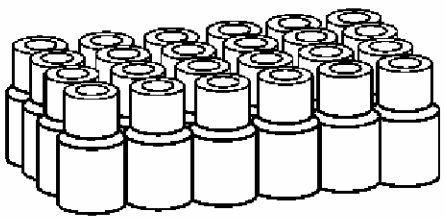
	
	J 41447 R-134A A/C Tracer Dye - Box of 24
	J 42220 Universal 12V Leak Detection Lamp
	J 43600 ACR 2000 Air Conditioning Service Center



J 43872
Fluorescent Dye Cleaner



	J 45037 A/C Oil Injector
	J 45268 Flush Adapter Kit
	J 46297 A/C Dye Injector Kit
	J 46297-12



Replacement Dye Cartrridges

2006 Buick Lucerne CXS

2006 HVAC HVAC Systems - Automatic - Lucerne

2006 Buick Lucerne CXS

2006 HVAC HVAC Systems - Automatic - Lucerne

2006 Buick Lucerne CXS

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